DOCUMENT RESUME

ED 224 725 SE 039 857

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|---|---|
| AUTHOR | Bhat, J. L., Ed.; Bandhu, Desh, Ed. |
| TITLE | International Conference on Environmental Education (Vigyan Bhavan, New Delhi, India, December 16-20, 1981). Abstracts. |
| INSTITUTION | Indian Environmental Society, New Delhi. |
| PUB DATE | 81 |
| NOTE | 130p. |
| AVAILABLE FROM | Indian Environmental Society, 8, Darya Ganj, New Delhi-110002, India. |
| PUB TYPE | Reports - Descriptive (141) -- Reference Materials - Bibliographies (131) |
| EDRS PRICE | MF01 Plus Postage. PC Not Available from EDRS. |
| DESCRIPTORS | Abstracts; Agriculture; *Course Descriptions; Ecology; *Educational Objectives; Elementary Secondary Education; *Environmental Education; Foreign Countries; Fuels; Higher Education; Interdisciplinary Approach; Mass Media; *Physical Environment; *Pollution; Postsecondary Education; *Program Descriptions; Science Education |
| IDENTIFIERS | *India |

ABSTRACT

Abstracts of papers presented at the International Conference on Environmental Education are included in this document. Although title, author(s), and abstract are provided for each of the 124 entries, a table of contents and author/subject index are not included. Topics and issues addressed focus on various aspects of environmental education curriculum, instruction, instructional strategies, courses, programs, and specific topics (such as education in landscape architecture) at all educational levels. These include, among others, environmental degradation and the future of man; planning for culturally relevant environmental education; newspapers' role in educating the masses on environmental education issues in India; the relationship between population education and environmental education; the role of environmental education in society; environmental education for professionals/decision-makers in physical planning; the importance of integrated earth-science studies; instructional model for environmental education; anthropology and environmental education; awareness versus education on environment; the role of research and development institutions in environmental education; the teaching of environmental geoscience in Indian universities; needs of global environmental policy for using fossil fuels; climatic control of agroecosystems in western India; women's health risk problems associated with traditional fuels use and energy alternatives in India; and the education necessary for a scientific assessment of environmental impact of water development projects. (JN)

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# INTERNATIONAL CONFERENCE ON ENVIRONMENTAL EDUCATION

## ABSTRACTS

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## ABSTRACTS

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**DEPARTMENT OF ENVIRONMENT**

3

# 1. MY LESSONS OF ENVIRONMENTAL EDUCATION

R. MISRA

*B 30/76, Nagwa, Varanasi, India*

The author has described the salient features of his understanding of the environment in a historical perspective. It developed through the study of ecology and ecosystem. The progress made by ecologists in discovering the unifying concepts of the subject which now encompass human activities are discussed as relevant to human ecology. It is pleaded that fragmentary and multi-disciplinary approaches to the study of human environment must yield to holistic and unidisciplinary or integrated presentation of the subject. The relevance of social sciences as well as the integration of the inner (soul) and the outer environment of man (nature) is shown in the context of Indian philosophy.

A syllabus of studies suitable for university students has been suggested. It develops from a systemic behaviour of physical, biological and sociological aspects of the environment to the concept of ecosystem including human systems. Natural, man modified and man made ecosystems are included for comparative study of their structure and function with reference to resources, waste disposal, pollution and social behaviour. It closes with an analysis of human behaviour and consciousness towards the environment.

## 2. ENVIRONMENTAL DEGRADATION AND THE FUTURE OF MAN

S.K. AGARWAL
*Department of Botany, Government College, Kota-324001*

Man is an integral part of the ecosystem which sustain life on this planet. If the ecosystem is tempered, the resulting ecosystem imbalance result is catalysm, and will have a strong bearing on man himself.

The benefits of commercial or development activity are immediate. However, the adverse of an ecological imbalance often take a long time to manifest. But, when they do, it is usually too late to undo the damage.

In a developing country like India, we have a lot of environmental problems, which are associated with industrialization, urbanisation, and over-population. We have conventional laterines, open sewers, open drains, coal 'angittis', increasing traffic of automobiles, chimneys of industries discharging air pollutants with disregard to ecological conditions and discharge of liquid effluents into fresh water either directly or indirectly. These features are a constant threat to our ecological balance.

It is difficult to understand that we are planning for the living or the dead. If at all for the living, then it seems that we have compromised with rubbish, dirt and pollutants, otherwise they should have revolted against it.

It is the high time that we have to educate our fellow people. They have to be taught to respect and regard nature, to live in harmony with it. With this aim a "Peoples programme for environmental education" has been prepared and will be shown with the help of slides.

## 3. AMERICAN ENVIRONMENTAL EDUCATION IN THE AGE OF ACCOUNTABILITY

CRAIG B. DAVIS

*President, National Association for Environmental Education, Coordinator of Environmental Studies, Iowa State University, Ames, Iowa, U.S.A. 50011*

R. THOMAS TANNER

*Assitant Coordinator of Environmental Studies, Iowa State University, Ames, Iowa, U.S.A. 50011*

The education community in North America responded to the environmental movement of the late 1960's by creating a diverse assortment of environmentally oriented programs and curricula: environmental science, environmental design, environmental engineering, environmental studies, and environmental education. American environmental education is largely "delivery" oriented. Content is, for the most part, taken as a "given", and emphasis is placed on developing effective methods for presenting this content to school students and the general public. Its roots in the activist-oriented environmental movement and its emphasis on pedagogy have created an identity crisis for the profession. Should EE be advocacy oriented or should all points of view be presented with equal emphasis? What is unique about the pedagogy of EE? How does it differ from science education or social studies education? American environmental educators must answer these questions and establish a professional identity for environmental education if they are to expect continued support from government and industry in an age of decreasing resource availability.

## 4. ENVIRONMENTAL EDUCATION AT WHICH LEVEL?

MINATI RAYCHAUDHURI

*Indian National Science Academy, New Delhi*

People have presently become aware of the need of environmental education which aims to produce a citizenry

skilled enough to involve themselves in solving the environmental problems. In order to stress the importance of the subject, vital though it is, the protagonists of the subject are suggesting the subject to be introduced at all levels. In order to avoid the subject becoming a fad, some serious thinking regarding its introduction be made, especially regarding its introduction in pre-high school level. Even admitting the grave seriousness of environmental problem, it must be borne in mind that this subject is a specialised one and encompasses a multi-disciplinary activities. In our middle school curriculum, only basic sciences which are centuries old are taught and environmental education though vital it is, has not been made a part of junior school curriculum. From published literature, it can be easily found that even in developed countries where environmental problems have already assumed alarming proportions, there is a great disparity regarding the subject to be taught. What is needed perhaps is a general awakening about environmental problems, which can be done by introducing some selected topics in various branches of science-courses to which the problem belongs. Thinking dispassionately one is sure to find that the causes of environmental deterioration are so diverse in origin that their remedies cannot originate from any of the basic sciences.

It is clear that if we are to preserve for the future generation some semblence of the existing biological order and if we want to improve on the deteriorating standards of rural and urban public health, environmental education needs to be introduced at high school level so as to stimulate the students towards carrier opportunities in the vital area of environmental science and technology, which can be taught in the university level. It will enable us to have trained and skilled people who are knowledgeable concerning the total environment and its associated problems. The introduction of environmental science and technology at high school and university level will enable us to have personnel capable of developing scientifically rigorous criteria for environmental quality leading to adoption of realistic standard so that our technological progress can be tailored to meet such standard.

## 5. ENVIRONMENTAL EDUCATION BE TOUGHT TO PROFESSIONALS?

MOHAN S. DASHORA
*National Institute of Ayurveda, Jaipur (Raj.)*

Environmental education is one of the burning problems of the century and should be considered carefully before we reach a stage from where we cannot return.

Most of the underdeveloped countries are on a pavement for mass industrial developmental projects. At length development has been treated at par to the utilisation of natural resources, such as: use of mineral wealth, resulting in industrialization, etc. Consequent to this large industrial townships, besides many more already existing, to feed the growing need of the manpower so required, forests have been cut down for colonization and enmass requirement of food, fodder, medicines, etc. Large irrigation projects without consideration of its environmental consideration with a view of green revolution, power production, etc., pasture development for white revolution, is a chain requirement of all these developmental processes. Moreover, energy being one of the crisis call for mankind, radioactivity is actively coming in action.

Those who are at the helm of affairs, the professionals, the technocrates, hardly keep in the window of developmental consequences. In other words, they are unaware of environmental imbalance being caused on account of their actions. By the time this imbalance starts fruiting situation is too aggravated to be revertable. Large number of such examples are round us day and night.

All these are leading to the newer and newer diseases, more drug resistances, more toxic contents in the biological systems. Medical professionals are also not lagging behind the race.

To cure all these ailments over/under medication is under common practice. Consequent to this enmass use of

medicinal flora, extinction of many species in eminent, where as many other are going a waste in want of proper information and rational uses.

It is never late, even if the environmental education is prescribed as one of the principal course to the students of all categories of professional institutions with respect to its practical implications. This should also be infused by the religious media, lest we may save something for the mankind.

At length, it has been discussed to those in professional institutions and they disagree to incorporate such courses in want of over pressure of growing information in the subject with which it is difficult to keep pace with.

Thus for wider interest, it is to be incorporated in the course.

## 6. PLANNING FOR CULTURALLY RELEVANT ENVIRONMENTAL EDUCATION

**S.K. SHARMA,**
*Assistant Director, Health Services, Chandigarh Administration*

**D.N. KAKAR,**
*PGI, Chandigarh*

**M.L. ATRI,**
*PGI, Chandigarh*

The environment possesses two main avenues by which it may affect man's health—it may act upon within his body as a material agent, or it may act upon his mind and emotions as a non-material agent. Environmental factors having possible effect on health status can be conveniently grouped into : (a) the material environment and (b) the non-material envi-

ronment. In both material and non-material environments one can include several intrinsic as well as extrinsic factors which affect man's health. For instance, in the material environment, one can include such instrinsic factors as age, sex and hereditary characteristics. The extrinsic factors in the physical environment may include topography, climate, occupation, housing and several other factors of macro and micro environment. Similarly, in the biologic environment, one could include such factors as food, sanitation, infectious disease agents and vectors of disease producing agents. However, in the social environment the whole gamut of man's relations with man in terms of his way of life is included. On the other hand, in the non-material environment, while the intrinsic factors may include inherent mentality and temperament, the extrinsic factors may include man's conscious and subconscious behaviour, including his beliefs, values, attitudes and many other aspects of socio-cultural life.

Thus any attempt at brining about improvement in the environment from a holistic point of view must take into conderation all of these inter-related aspects. Any effective environmental education program has to be culturally relevant to yield the desired results. At present, one does not find any worthwhile environmental programme in the country. The few that are there are full of inadequacies, ranging from deficient training of personnel to improper cultural orientation.

## 7. SOME SUGGESTIONS ON ENVIRONMENTAL EDUCATION FOR GENERATING AWARENESS OF ENVIRONMENTAL PROBLEMS AT PRE SCHOOL, SCHOOL AND UNIVERSITY STAGES AND AMONG GENERAL PUBLIC

S.K. SARMAH

*Department of Environmental Science,*
*Gauhati University*

Environment oriented education may play an important role in generating awareness of environmental problems

among people in general and students in particular. The approach and types of courses to be introduced in various stages from pre-school to university level have been discussed. The approach to be made for generating awareness among general public is also briefly mentioned.

## 8. WHY DOES ENVIRONMENTAL EDUCATION CONCERN EVERY BODY?

SHREYASI VERMA and M.P. SINHA
*Deptt. of Zoology, Ranchi University, Ranchi*

Along with all other organisms our survival depends on the environment and environmental attributes both organic and inorganic. As one can not territorise the environment, so far its sound management is concerned, of the globe as a whole, similarly the environmental education tresspasses the boundaries of nations and continents.

By education, in general, we mean a system concerned only with those who are literate irrespective of their degrees, specialisation and performances but so far environmental education is concerned, it concerns each and every individual whether literate or not and to be more particular it is of more importance for those who belong to user level and exploit the natural resources irrationally. One of the inherent aspect of environmental education is to create awareness in masses towards the need of environmental conservation.

Although' ecological thinking' is the basic feature of this wise approach and consequently of environmental education, this education cannot be only a matter of science and especially of biology teaching. Environmental education on the principle of modern conservational measures of nature and natural resources and landscape planning and management—including not only scientific but also broader cultural, economic, aesthetic and ethical aspect is an essential part of gene-

ral civic, moral and liberal education.

Environmental education, in true sense, combines every discipline and every level of people aiming at ascertaining the survival of mankind, has been discussed in the present communication.

## 9. AN APPROACH TO ENVIRONMENTAL EDUCATION

A.F.S.A. AOWAL

*Professer of Environmental Engg., Delhi College of Engg., Delhi-110006*

The deterioration of environmental quality, which began when man first started collective living and utilised fire, is progressively increasing and attaining new dimensions under the ever increasing impacts of exponentially increasing population and with increasing quest for industrialisation. If this unhindered deterioration of the environment is allowed to continue, the earth will no longer be a fit place to live. Unfortunately the awareness of the populace at large to this increasing peril ranges between petty meagreness to nothing. Hence the necessity for environmental education.

The environmental education can be imparted in two lines, namely—(a) through the Integrated Approach and (b) through the Segregated Approach. The integrated approach envisages the encompassment of the entire society covering the young and the grown up alike and aims at creating awareness in all of them towards their standing vis-a-vis the eco-system in which they live and their responsibility in safeguarding it against erosion and consequent destruction by their own activities. The integrated environmental education can be imparted gradually by incorporating the general knowledge of the relevant topics in the curriculum of the primary education and then enlarging the same knowledge in the secondary education by emphasising the environmental impact part in

some more detail. This education plan need to be extended to the general public through the media and to the key sector through extensive and comprehensive but subsidised vocational training, workshops and seminars. The knowledge of the relevant laws pertaining to environmental protection should also be disseminated to the entire public.

The segregated approach of imparting environmental education aims at the creation of an infra structure of experts in both the fields of environmental science and engineering who are called upon to tackle the myriads of problems according to their own merit—the former working in complete harmony and co-operation with the latter. Both these groups can be subdivided into a number of specialities like environmental industrial enginecring, enviromental mechanical engineering, environmental sanitary engineering, environmental town and country planning, environmental micro biology, environmental zoology, environmental botany etc. It is obvious that all these expertise can be developed only in the highest level of education and that all these individual domains must be correlated to each other and to the central and primary aim of controlling and preventing environmental deterioration.

The integrated and segregated models of education should be subjected to periodic scrutiny on the basis of the feed back on the impact of the imparted education and should be modified or updated accordingly.

The environmental education model therefore can be built into a system model where inputs will be the integrated and segregated environmental education, the system characteristics will be the general receptive capability of the citizen, the economic, social and political parameters and the system response or out put will be a general awareness of the environmental problem and an action plan to combat and prevent environmental deterioration. There will be a filter of environmental knowledge and implementation an a feed back component comprising the difference between the plan and implementation,

## 10. 'NEWSPAPERS' ROLE IN EDUCATING THE MASS ON ENVIRONMENTAL ISSUES IN INDIA

T. SEKAR

*School of Environmental Sciences, Jawaharlal Nehru University, New Delhi-67*

Creating mass concern with environmental issues is an essential need to preserve and maintain the quality of environment. The mass media, which reach the largest population of the country have a certain educative role to play in imparting knowledge on the problems of environment. The present study analyses the extend to which Indian newspapers serve in fostering environmental awareness among the people. The content analysis of three largely circulated english dailies indicated that newspapers publish news items, editorials, and articles on environmental issues of local, national, and international interest which they bring about in sufficient intensity consistent with scope and time. Results of a opinion survey among university students suggest a limited educative role of the Indian press in creating mass concern with environmental issues. Two mass media-public interaction models have been discussed in light of their applicability to the environmental problems of India.

## 11. ENVIRONMENTAL EDUCATION WITH SPECIAL REFERENCE TO MADHYA PRADESH

M.P. SINGH

*Department of Botany, Government College, Sihora (Jabalpur) 483225-India*

Environmental education should be included in the curricula of primary, higher secondary, under-graduate and postgraduate courses of various institutions, boards and universities. In the primary and higher secondary classes the topics included in the courses should be written in simple local languages with illustrations and local examples. The

teaching should be through environment. The students should often be taken out of the classes to the sights and should observe the impacts of various activities on their environment.

At the university level at least one paper should be included on the environmental education for undergraduate courses. Environmental education should be taught at post graduate level as one of the subjects for master's degree in the universities. To sight an example APS, university, Rewa offers the mater's degree in Environmental Biology.

A series of seminars workshops conferences etc. should be organised at national and provincial level to train the primary, higher secondary, college and university teachers. For such activities Indian Environmental Society, Department of Environment, UGC and other similar organisations can play vital role in providing finances and technical help.

These trained teachers should organise similar activities to educate and involve rural people who constitute about 80% of the Indian population and are mostly uneducated.

## 12. IMPORTANCE OF ENVIRONMENTAL EDUCATION FOR HUMAN WELFARE

C.K. VARSHNEY

*School of Environmental Sciences, Jawaharlal Nehru University, New Mehrauli Road, New Delhi-110067*

During the last decade there has been a fundamental change in our thinking with regard to man-environment equation. It is increasingly realised that the nature of environment plays a crucial role in determining the quality of life and the well being of the society. Technological developments and economic progress depend on the resources obtained from the environment which are finite and not unlimited. Moreover, developmental activities pursued without due

consideration to their ecological implications cause considerable environmental degradation. This ultimately undermines the developmental objectives. Environment is an essential resource for development and its optimum utilisation and wise management is necessary for progress and national planning. In view of rapidly expanding population and consequent stress on our finite resources environmental education has assumed a high priority for human welfare.

Knowledge on contemporary environmental matters should form an essential input at all levels of education to promote public awareness for providing a proper perception of environmental concern.

The package of environmental education will vary with the target group but the basic concept of ecology—the science of interrelationships—must form the essential framework for such programmes in environmental education. The knowledge of ecology helps to develop a holistic view point which enables to take an over-view in a long term perspective. It also promotes interdisciplinary attitude in order to deal adequately with natural, social, aesthetic, and ethical dimensions of environmental issues.

The paper examines the concept of environmental education with particular reference to training of teachers and educators.

## 13. RELATIONSHIP BETWEEN POPULATION EDUCATION AND ENVIRONMENTAL EDUCATION

SUSHAMA MERH
*Project Coordinator, Population Education Project, NIEPA, New Delhi-110006*

**Section I**

The section will attempt to define the relevant terminologies and concepts and discuss the nature and charac-

teristics of the two areas with regard to their basic educational philosophy and rationale in the global and national context. Terms such as 'Population' and 'Environment' will be examined in view of this and the relationship between the two established within their educational perspectives.

**Section II**

This section will deal with the substantive components of the two educations. Areas of overlap will be identified, defined and discussed in the light of their emphasis, focus and objectives.

**Section III**

An attempt will be made in this section to highlight the relationship of the two areas with other educational curricula and programmes at different levels-school curricula, higher education including teacher education. This will also examine the linkages with other programmes/agencies that are implied with regard to their implementation strategies.

**Section IV**

This section will try to develop an integrated model for developing both the programmes within a system approach in educational development. Agencies and their roles will be discussed and their reinforcing relationships will be highlighted in view of the aims and goals of both population education and environmental education.

## 14. SIGNIFICANCE AND IMPORTANCE OF ENVIRONMENTAL EDUCATION

L.K. DADHICH

*P.G. Department of Botany, Government College, Kota-324001*

The changing environment has profound influence on illness and diseases. There is no doubt that our environment has been and still is in the process of being altered due to progressive industrialization. Modern science and scientific

methods in technology has brought us new diseases with the disappearance of classical diseases.

Mankind is heading faster towards both utopia and catastrophe. Growing technological capabilities are being used by man to transform the entire earth towards sophistication or destruction. With the new technology, though, there is hope of adequate food, clothing and shelter yet there is also fear of thermonuclear war, exhaustion of the earth's natural resources, over population and pollution.

A time has come when the government should realize the education as the key and must introduce a study of ecology in the school system.

Suggestions for the revision of the primary, Secondary and college curriculum have been made in the present paper and a need for subject oriented course has been stressed.

## 15. ENVIRONMENTAL EDUCATION AND ROLE OF MASS MEDIA IN INDIA

**SUBHAN KHAN, M.L. SHARMA And R.K. PUNIA**

*Department of Sociology, Haryana Agricultural University, Hissar*

The complex association of man with nature changes geographically and evolutionally, exposes man to varied environmental influences in the course of history. Today it is becoming increasingly important to combat the danger inherent in the growing deterioration of our environment-pollu-

tion of air, water and soils; physiological and mental aberrations resulting from the mechanizations of life; the artificial and violent sitmuli as noise; depletion of unrenewable resources; increasing contents of chemicals in human and animal foods and their lethal effects; deterioration of natural conditions and ecological balance and the like activities, detrimental to the natural environment.

Environmental education is the first and foremost step in saving the environment from further deterioration. The real task of the day is to make the people aware, create interest and involvement in them to provide basic knowlege about man nature interaction and its effects to adopt the recommended measure for maintaining the ecological balance. No programme of rational environmental management can be successful until and unless the common people are familiar with the theory, principles and practical methods of safeguarding and using rationally the national resources and improving man's environmental conditions. Hence, environmental education has most important role to play in solving the major problems of environmental deterioration and of nature conservation.

In this paper an attempt has been made to assess the role of mass media in imparting environmental education to large illiterate and isolated rural audience of large distances. The social acceptance of various mass media of communication such as radio, films, television, newspapers are discussed.

## 16. "ENVIRONMENTAL EDUCATION AND POPULATION PROBLEM OF INDIA"

SOM DEO SHARMA

*Asstt. Professor of Geography, Mahakoshal, Arts Mahavidyalaya, (University of Jabalpur), Jabalpur, India.*

The paper attempts to study the way in which population problem of India can be solved with the help of environment-

al education. The old Malthusian theories of over population approves here.

India is the second largest country, in terms of population, of the world today. Nearly fifteen percent of the world's population is in India, but the country accounts for only 2.4 percent of the total area of the world. The present population is 683.8 million (1981). The urban population comprises 23.73%. The density of population is 221 persons per $Km^2$. The coastal belt of Kerala, the Calcutta area and north western belt of Bihar have high densities. Nagaland, Sikkim, Andman Nikobar Islands, Mizoram and Arunchal Pradesh have the population densities of less than 51 persons per $Km^2$. Half of the males and nearly three-fourth of the females in the country are still illiterate. Within last eighty years the population has trippled. Population growth was 24.75% in the decade 1971-81. The mark of one billion persons is expected to reach by the end of this century. Out of this one third may be the urban population.

With the increasing population the environment of the country, especially that of urban areas, is deteriorating day-by-day. Forest and mineral resources are depleting. Agricultural and industrial production is not keeping pace with the growth of population. People are loosing social, cultural and ethical values. Conservation of natural resources and reducing the birth-rate is urgently required. This is high time for environmental education in the country to improve the quality of life, to create an awareness emong the people on environmental problems, to develop necessary skills to solve environmental problems, to make it possible for people to participate in decision making concern in the environment and to provide an awareness of econmic, political, social and ecological interdenpendance.

## 17. HOW MASS MEDIA MAY AROUSE ENVIRONMENTAL AWARENESS IN MASSES

INDRA KUMAR SHARMA
*Bhagwati Bhavan, Ratanda Road, Jodhpur-342020 India*

Masses play vital role in deterioration or improvement of environments around villages, towns and countrysides. Motivating them massively for conservation of environment is necessary, press, radio, television are prominent mass media for the purpose. Comparative study of effects of various mass media were studied at various villages of Jodhpur district and Jodhpur city. Press is much effective mass media, surprising but of utility news-features prove much attractive and effective to masses—readers of newspapers. Illustrated articles in news papers sunday supplements and popular magazines with somewhat astonisning hints and appealing suggestive informations draw much attention of masses and cast deep impression for enviroment conservation utility. Pyratic stir of Indian press against shooting of houbara bustard by the prince of Arabia in the Indian desert in 1979 aroused mass public awareness against hunting and for conserving the bustard. Radio-talks and programmes for environment conservation for rural people and school children are much impressive and effective, if given with lucid style by noted personalities. Television is much effective provided having informative interesting, and suggestive documentary shows. Colour TV programmes are more charming and impressive to present fascinating beauty of nature. Some nature oriented programmes by Bombay TV center have proved as catalystic massive stir for nature conservation among TV spectators. Similarly, documentary film shows at schools, colleges, nature clubs and societies, information centers and squares of villages and towns play massive suggestive role for educating masses for conservation of nature. Many feature films on conservation of wildlife e.g. Born free, Darkest Africa and Living Desert etc. proved immense popular among masses impressing and encouraging masses for conservation of nature. Such nature education films are desirable for mass education for nature conservation.

## 18. ENVIRONMENTAL EDUCATION FOR PASTORAL COMMUNITIES OF ALPINE ZONE OF CENTRAL HIMALAYA

ARCHANA NAITHANI
*Lecturer, Dept. of Botany, Garhwal University*
*Srinagar (Garhwal) U.P. 246174*

The environment is in itself a curriculum for study not only to the individual but for the entire community. Such community educational system should provide not only a motivation to the learners but also imbibe in them an urge to develop the local economy. The individual must know his environment, apprehend the dangers facing it and improve it to the best advantage of the local population. The pastoral communities of Central Himalayan Alpine Zone fall into two distinct groups viz., the local native community and the migratory Gujars visiting from the foothills during the summer season. The local population mostly rares sheep and goats while the Gujars visit these areas with their large herds of buffaloes. The damages done to the alpine environment by the Gujars are far more in magnitude than those done by the local people. The present paper suggests some outlines for educating the pastoral communities of alpine zone of the Central Himalaya who are mostly illiterate so as to make them aware of the environmental problems of the region. These people in groups as well as individually should be able to acquire the basic understanding of the environment through some suitable agency. The attitude and skills of these people are to be channellized in such a manner that all of them involve themselves very actively in all the future programmes of environmental management and planning.

## 19. A PROPOSAL FOR MASS EDUCATION OF ENVIRONMENT

RAJANI VARMA and R.R. DAS
*School of Studies in Botany, Jiwaji University,*
*Gwalior-474011 India*

The advancement of nation today is gauged by the extent of scientific, technological and industrial development.

The phenominal advancement in the medical sciences has conquired many of the dreadest diseases, resulting in the decrease of death rate specially the infentile death and increase in the longivity. This has resulted in the explosion of population. The means of sustanance being limited has resulted in large scale problems resulting in the degradation of the environment.

The limited resources for imparting education associated with a large population cannot provide the required education to the greater proportion of its population. The problem of environment is one where every individual is equally important and needs proper education. This problem can not be solved without arousing a general awareness towards the prolems of environment. A handful of educated people having wide knowledge and understanding cannot finally solve the problem of environment.

It is, therefore, essential that a programme for the education leading to awareness towards the environmental problems be aroused amongst general masses. To achieve this, the mass media of instructions like cinema, T.V., Radio, etc. have to be mobilized. The paper deals in detail the ways in which these media can be mobilized to educate the masses for arousing the environmental awareness amongst them.

## 20. ROLE OF ENVIRONMENTAL EDUCATION IN SOCIETY

M.L. SHARMA, MALKIT KAUR and SAVITA MEHRA
*Deptt. of Sociology, Haryana Agriculture Univerrity, Hissar*

According to Max Nicholson "Environment during the past century has undergone revolution: population has exploded, physical resources are being increasingly depleted and technological growth has been phenomenal resulting in an unprecedented air, water and noise pollution, land deterioration and accumulation of pesticide residues. Now the time has come when we should be careful otherwise we are bound to

find ourselves in an irreversible predicament, in an ecological catastrophe, which will bring an end of the homo sapiens on this planet."

In order to avoid this catastrophe we have to understand different socio-economic, cultural and technological forces which are at work in bringing about the situation. It can be done only through environmental education which should try to tackle these probiems after understanding their dynamics. So far this field has been neglected and has not received any support from the academic institutions but this is an emerging area which needs development and building of literature. It will be having a wide scope and it will be an eye opener to many who will study it. It will tell how much havoc we have done by our activities and by products to this planet. It will also inform us how we can manage ourselves, our institutions and direct planned change so as to avoid ecological imbalances and environmental pollution. It will also inform us about the methods and techniques of controlling the environment, establishing proper ecological equilibrium and may curtial the use of those substances that are harmful to man and plants, conservation of resources and control of environmental pollution with an aim to improve the quality of life by creating an awareness among people about the environment problems.

Environmental education will also try to develop necessary skills to prevent the environmental problems and to create awareness among the people about inter-dependence of various aspects of the environment so that they can participate effectively in decision making bodies of the society for preservation of environment.

## 21. ROLE OF EDUCATION IN GENERATING ENVIRONMENTAL AWARENESS AMONG THE PUBLIC

G.S. VIJAYALAKSHMI

*U.G.C. Research Associate in Fish Culture,*
*Sri Parasakthi College, Courtallam-627802*
*(Tamil Nadu)*

Environmental pollution and human efforts for betterment of living standards are two sides of the same coin.

There can be no two opinions that environmental degradation should be checked by infusing the thought of "preserve Nature and save Mankind" starting from the school level through university and among the general public. The environment we live in has to be dealt with tacitly so that earth is not doomed by pollution. Where our ancestors faced their problems through a creative philosophy to preserve our environment we are faced with a situation requiring emergency action. Time has come to create environmental awareness through formal and non-formal education among the young and the masses. A basic aim of environmental education is to succeed in making individuals and communities understand the complex nature of natural environment and acquire the knowledge and practical skills to participate in a effective way to predict and solve environmental problems and in managing the environment with utmost concern to maintain its quality. The involvement of universities and colleges in the N.S.S. Programme provides us a good opportunity to transmit the message of environmental awareness among the general public. By generating the inner urge for environmental awareness among the people we can hope to achieve a clean environment free from pollution. Environmental awareness should be finally made lifelong process beginning at the pre school level and continuing through all formal and non-formal stages.

## 22. A STUDY OF ENVIRONMENTAL AWARENESS AMONG CHILDREN OF RURAL AND URBAN SCHOOLS AND NON-FORMAL EDUCATION CENTRES

V.P. GUPTA, J.S. GREWAL and J.S. RAJPUT
*National Council of Educational Research and Training Regional College of Education Bhopal 462 013, India*

This paper gives findings of a research study in which environmental awareness of three groups of children—rural, urban and non-formal education centres has been compared.

While the children studying in these three educational settings have displayed almost the same level of environmental knowledge about certain aspects, there are some areas where knowledge of these three groups was found to be rather inadequate. Lack of knowledge in certain aspects may be due to the fact that abilities of application and critical thinking have not yet developed among these children who are still at the concrete operational stage (7 to 12 years). The study has implications for curriculum development at elementary level in which case, care may be taken to include environmental knowledge of those objects which are concrete in nature.

## 23. ROLE OF MASS MEDIA IN DISSEMINATING ENVIRONMENTAL AWARENESS AMONG THE PUBLIC

N. RENGATHAN

*Central Information Service, Field Publicity Officer, Government of India, Tirunelveli-627 002*

The development of our social progress is based on our increasing ability to communicate with one another. Mass communication means dissemination of information ideas and entertainment through various communication media which encompass radio, film, television, press, publications and advertising. In some developing societies they coexist with important traditional media such as folk dance, drama and puppetry. The Indian society at the grass root level is complex system of varied classess, clans, caste and creed based barriers cultural complexity and illiteracy. The high rate of illiteracy added to the inadequacy of mass media to reach almost 80% of India's 680 million who reside in villages make the country pitch the hopes on traditional media like folk dance, song and drama etc. with a view to focus the need for creating environmental awareness among the masses. To most of them "To see is to believe" and so the mass media channels prove to be glamourous and the impact upon them is indeed great. Today in India there are 13,320 newspapers and periodicals on

record (at the end of 1977). Radio was started in 1927. All India Radio's net work consisted of 6 broadcasting stations at the time of independence; to day there are 84 broadcasting centres (as on 31-12-78). One of the effective media is the broadcasting system, which has a wider reach than other media. T.V. can educate the massess on socio-economic themes like environmental cleanliness, health care etc. but its scope is very limited as it is urban oriented. Next to radio, films are more potent medium since the impact of films can be felt immediately. The mass media can discard the art of impossible. Mass media followed by persuation will certainly have commendable impact upon the masses. To achieve the desired effect mass media requires an emphatic approach with the combined weight of social and behavioural scientists, media specialists, extention workers and the people themselves.

## 24. ECOLOGICAL BACKGROUND OF GARHWALIS IN WESTERN HIMALAYA—A CASE STUDY FOR INVIRONMENTAL EDUCATION

R.K. GUPTA, VIMAL KISHORE and RAM BABU
*Central soil and Water Conservation Research and Training Institute, Dehradun-248195*

The Uttarakhand region comprising of the Garhwal Himalaya in uttar Pradesh can be proud of triggering a movement for saving trees. Experience of working on an Operational Research Project for transfer of technology on watershed management carried at Fakot in an area of 370 ha on Tehri—Rishikesh road showed that there is an urgent need for environmental education in the region. The local inhabitants fixed priorities on their immediate gains and needs and cooperated on programmes coinciding with their priorities such as water resource development, crop improvement, orchard development, fuel and fodder plantations etc. The environmental considerations received the last priority. Ecological infrastructure and background of the rural folk has been highlighted emphasizing the need for environmeetal education; efforts made in this direction have been discussed in the paper.

## 25. ENVIRONMENTAL SCIENCE AND FUTURE OF MANKIND

O.N. SRIVASTAVA
*Department of Bot., Ranchi University, Ranchi-834008, India*

Environmental science attempts to identify, define and analyse those physical and biotic processes that influence, or are influenced by man's actions. The whole focus of environmentalscience, is the complex of interacting processes which together include the total enviroment. It should appear quite evident that the modification or interruption of any single process or cycle will trigger off a chain reaction affecting the total environmental system. Environmental scientists must, however, go beyond interpretation of natural changes and look to human modifications of the environment. The present status of environmental science as a dicipline is still in a formative stage and researches are still to be done for the establishment of more realistic, holistic approach to the environmental study. The present daycall has been for the development of programs in environmental education. For example (1) new thinking must occur in traditional educational approach to the environment and (2) training programs must be established for working with and understanding the multidisciplinary nature of the environment. Such developments are slowly coming in educational institutions and public anministration areas but, if environmental science is to develop into an integrating discipline capable of contributing significantly to the present day environmental crisis, much remains to be completed.

## 26. ENVIRONMENTAL EDUCATION FOR PROFESSIONALS/DECISION-MAKERS IN PHYSICAL PLANNING

A.J. CONTRACTOR AND JITENDRA SINGH
*Professor and Reader respectively, in Deptt. of Arch. and Planning, University of Roorkee, Roorkee.*

Architects, planners, real-estate developers and construction agencies, have been indiscriminately exploiting nature,

all over the world, in the name of development and progress. This rampant violation, of the delicate ecosystems of nature, has resulted in many complex problems for mankind; and if this dangerous trend continues unchecked, it will ultimately lead to the annhilation of life-forms on this planet.

This paper first tries to review the causes and circumstances, which have led to the present chaotic situation, and to assess the role played by architects/planners/decision-makers, in our so-called "development-programs". It then endeavours to focus the attention of all concerned—fellow-professionals, decision-makers and the lay-public—through educational-programs on the importance of an inter-disciplinary approach to physical-planning in harmony with nature and its complex ecosystems. Among other things, it emphasises the urgent need for creating a general awareness among people, for the preservation and protection of the natural environment, and more so, among those professionals who are responsible for planning and constructing townships and other similar projects.

The authors have attempted to modify past knowledge, and adapt it to the changing concepts and requirements of the present, in regard to the planning and construction of buildings, towns and similar projects, in harmony with MOTHER NATURE, so as to save mankind from future-shock.

The knowledge so acquired, will have to be systematically collected, scientifically classified and extensively disseminated, through various educational platfroms, media and programmes, in order to reach one and all: the professionals, decision-makers on the one hand, who are charged with the responsibility of the creation of these massive projects, and the lay-public on the other hand, for whom these are being created so that both parties develop awareness and respect for the all-important life-giving processes of nature on this dear earth of ours.

# 27. ENVIRONMENTAL EDUCATION AS COMPONENT OF ALL EDUCATION

A.K. JALALUDDIN
*National Council of Educational Research and Training*
*New Delhi-110016*

The paper consists of three parts—conceptual framework, areas of immediate and long-term concerns, and policy implications of strategies for implementation.

A holistic or ecological view of life, education, and environment calls for a systems approach to the understanding of the inter-dependence of natural, social, technological and psychic factors which influence not only the survival and development of man, his community and society, but also the planet, earth. The internal organisation of climatological, hydro-logical, geo-tectonic and other physiographic factors, their topological and temporal variations and their linkages with other sets of variables defining the technological, economic and socio-cultural components have been explained as the matrix for an operative understanding of the systems like energy, food, health and nutrition.

The growing and contemplated use of outer space, sea bed and sea current, chemicals and germs in the until recently unutilised for military, political and economic advantages of invididual nations, constitues a modulation on the above systems with serious destructive potentials. These developments coupled with the continued imbalances in the distribution and utilisation of resources at the individual, community, national, regional, and international levels pose challenging tasks to the intellectuals, professionals and the academic community of developing appropriate multidisciplinary courses, training and research programmes as viable, supportive modes of intervention. Such education and research demand organic linkage between experience, knowledge and action.

While the fundamental issues identified in the process of studying environment as systems may be integrated with the

relevant academic disciplines, the succcss of an environmental education and research programme would depend largely on how honestly and scientifically location-specific educational programmes are designed for enlightened decision-making and community action. Experience shows that such community participation is effectively realised when the educational leadership shows a high sense of moral and social responsibility and relevant knowledge, skills, and values are transferred to the learner-participants for development of self-initiative and self-reliance.

## 28. TEACHING-LEARNING STRATEGIES FOR ENVIRONMENTAL EDUCATION

J.S. GILL
*Department of Education in Science and Mathematics,*
*National Council of Educational Research & Training*
*Sri Aurobindo Marg, New Delhi-16*

In order to fulfil the fast changing expectations and demands of the society the educational system needs rejuvenation from time to time in terms of content and teaching methodology. The curricula accordingly keep on mutating, sometimes even beyond the optimal limits available in the educational set up as such. The innovations coming in wake of the new expected role of education create hardships for developing nations intending to assimilate the same.

Teaching-learning strategy an important aspect of curriculum development, helps in achieveing the set up objectives through the throughtfully identified content. Though the emphasis in school curriculum world over, has shifted to the knowledge of environment, little efforts have gone into either for designing new teaching strategies or testing the applicability of the available teaching-learning methodologies for environment *based* and environment *biased* education.

The paper discusses some of the invogue teaching-learn-

ing strategies in relation to environmental education. These are already being employed by the class-room teachers for teaching of science and other disciplines. Besides highlighting need for greater attention to this component of the curriculum the paper also gives experiences of author with some of the strategies tried out in training programmes organised for teachers and teacher educators by the department and other agencies.

## 29. ENVIRONMENTAL EDUCATION — AWARENESS AND SENSITIVITY

S.K. SHARMA

*Secretary Govt. of M.P. Dept. of Housing and Environment Bhopal, (M.P.)*

Participation of the entire community is essential for successful implementation of any environmental programme. For inducing participation bringing about greater awareness through environmental education will play an important role. Systems will have to be developed for making administrators, project managers, technical personnel, educationists, general public and school communities aware of the importance of the environment to man.

Awareness alone is, however, not likely to achieve the desired objective. One may be aware of the need for proper environmental action but unless one is sensitive to one's environment, purposefulness, dedication and motivation in any activity cannot be achieved. Sensitivity means something much more then mere awareness. It is a very personal and inner experience. Sensitivity in a person is usually a born characteristic but it can be inculcated through right type of exposures and interaction. Again, a person may be sensitive to certain matters but may be totally insensitive to others. For example, a person may be sensitive to music and painting but may be totally insensitive to architecture or the wilderness of the forests. It is rarely that a person may be sensitive

to all the facets of environment. Yet, sensitivity towards any one aspect makes a person more amenable to developing sensitivity in others.

For any form of human activity, organisations are essential but organisations, particularly large organisations like public organisations, by their very nature, tend to be insensitive. It is of vital importance that environmental education be specially oriented to improve the sensitivity of those who constitute organisations. Except where sensitivity is inborn, it will have to be inclucated through training and exposures, preferable from a very young age. Environmental education should be designed to improve sensitivity not only towards the natural environmental but also towards the creative art forms developed by man for, it is sensitivity towards arts which can curb his instincts to destroy the beautiful in nature.

## 30. ENVIRONMENTAL EDUCATION: SUCCESS AND FAILURES; PROBLEMS AND STRATEGIES

**BRIJ GOPAL**

*Dept of Botany, Univ. of Rajasthan, Jaipur 4, India*

The seventies have been the decade of environment and unquestionably much has been achieved in creating global awareness about the problems of environment. Large national and international efforts have been made for environmental education with some success. A decade is too small a period in the history of mankind and one cannot expect to find an immediate solution to the environmental ills developed over millenia nor one can expect that the process of development can be brought to instantaneous halt without its side effects. Yet, the pace of environmental deterioration is so rapid that we cannot afford to lose time in experimenting with alternatives till everything gets totally out of controls. Like the environment, the problems are complex and have to be viewed holistically. The basic problem, as it appears to me, has been the sectoral approach and lack of

integration in our efforts to restore the environment. Education itself has come to be recognised at several levels-school education, adult education, higher education, technical education, and environmental education. The environment is being considered alien to man, not something which sustains man. If only we were to know the *totality* of our environment and its indivisibility, the education would be easier, and the problems readily solved. The environment brings to different people's mind different things: urban conglomeration, noise, air pollution, water pollution, deforestation, energy crisis, and so on—and all these are considered unrelated. At different levels of education, emphasis is laid on one or the other component of the environment, blowing it sometimes out of proportion and treating other components insignificant. The environmental problems created by developmental activities are considered unavoidable, too small to be of immediate impact and far little important even in the long run as compared to immediate benefits. This attitude widens the gulf between the environment of the haves and have-nots.

Whatever be our strategy for environmental education and improvement of our environment, only a holistic approach can yield the desired results and turn failures to success.

## 31. SIGNIFICANCE OF ENVIRONMENTAL EDUCATION

**K.V. DEVASIA**

*School of Environmental Studies, University of Cochin, Cochin-682 016.*

The health of man is intimately related to the health of the environment. Hence it is a paradox to visualise a healthy man in an unhealthy environment. The health of the environment means the quality of the environment. As the quality of the environment deteriorates the quality of life also declines. In order to assess the quality of the environment a thorough awareness of it is a must. It is in this context that

the significance of environmental education comes into picture. The structure of the environment, with its vital components like inorganic, biologic, physical, nutrient, and social, is profoundly complex. To deal with the multifarious environmental problems, environmental education is essential and indispensable.

Environmental education is the process of recognizing values and clarifying concepts inorder to develop skills and attitudes necessary to understand surroundings. Environmental education also entails practice in decision-making and self-formulating a code of behaviour about issues concerning environmental quality.

The changes in the environment are manifested through the organisms. Man is no exception to this rule. Hence a strong environmental consciousness is a basic necessity to all sections of society like the mass, the scientists, planners, developers, doctors, architects, teachers, students, politicians etc. to protect the environment to have a better quality of life.

It is said that man's ability to foul his nest on a lasting basis, on more than a local scale, is a recent phenomena of what has been called "careless technology". This is evidently because of man's parochial outlook, his inability to anticipate things and above all because of his superiority complex. He was never willing for a compromise with nature. A number of serious ecologists like Eugene Odum warned that the pressures of both pollution and population were increasing faster than total resource requirements can be produced and recycled, and that technology alone cannot solve these problems without some form of quality for human values. As a heterotroph sitting very high on the food chain, man could not afford to disregard its gradual poisoning.

Lack of environmental education is the cause of the present unhealthy environment. If man has utterly failed to develop environmentally sound technology it is because of his ignorance about the environment. Thus the planners and

developers who gave shape to big cities and industries never thought about the severe problems of congestion, lack of housing, inadequate access to sanitation, water supply and waste disposal ensuing urbanisation and industrialisation; the architect who designed skyscrappers did not have the clairvoyance to understand the social and psychological conflicts involved in a highly industrialised modern urban society; those who cut the forests and made dams and farmlands could never anticipate the grievious problems of erosion, salinisation, deforestation, flooding, waterlogging, silting up of reservoirs and streams, clogging up of irrigation networks, and unfavourable changes in the local microclimate patterns.

Thus it is high time that environmental housekeeping is taught to all categories of people. This is essential for a change in our outlook towards nature, for a change in our philosophy.

Non-formal environmental education is to be imparted to the masses and to people already in various professions. The Universities should act as the brain which anticipate and identify the various environmental problems. As today's students are tomorrow's architects, planners, developers, administrators etc., it is the duty of the universities to make them good environmentalists for the environmentally sound development of the future.

## 32. IMPORTANCE OF INTEGRATED EARTH-SCIENCE STUDIES.

SAILES C. CHAKRAVARTY
*1, Sadhna Enclave, New Delhi-110017*

Initiated at the advent of the Holocene period, about 10,000 years ago, the present sea-level, climate, the total ecosystems are considered to have had reached near stabilization about 6,000 years ago. The history of ancient civilization can reach back 6,000 years into the past. The Holocene saw

the rise of the Neolithic culture, domestication of animals, cultivation of plants, growth of agriculture and urban settlement. 'Man and his Environment with which he is equilibriated' are, however, both considered to be products of the Quaternary Era, which was heralded, about two million years ago.

Man, both a creature and moulder of his environment, is thus more concerned with the history, origin, growth and developments in the Quaternary and of the Quaternary formations, and not without reasons. Our agriculture, our grain-producing fertile river-valleys, alluvial terrains and deltaic regions, our reservoirs of ground-water in the unconsolidated rock-formations, many of our "Minor Minerals" and quite a few of our "Major Minerals", even the noble metal gold, in the 'placer deposits', not to speak of soil, our most treasured heritage, are sustained by, are the products of the Quaternary and/or are Quaternary derivatives.

With examples cited, the importance of the study of the disciplines and sub-disciplines of Earth-Science—geology—geomorphology, geohydrology, geo-/neotectonics, fluvial processes, geophysics, geochemistry etc., and other disciplines, in the appreciation of the total human eco-systems, including the city, the sea and the wilderness—with a view to ensuring a lasting balance with environment, is highlighted.

Importance of multi-disciplinary approach and of interaction is underscored. Mentioned particularly are those disciplines and sub-disciplines 'which deal with the form, content, process and time, which are fundamental requirements for understanding the nature and genesis of an alluvial valley'—our life-sustaining, grain-producing, soil-forming/turning/eroding, river-valleys and deltas, the causes and consequences, good and bad, of the phenomena of creation, stabilization, and destruction—the visible and not so readily noticeable signs of the workings of the laws of nature,—as these have to play crucial roles in meeting the challenge of maintenance of the ecological balance and preservation, improvement and protec-

tion of the total environment-total geological environment, being most relevant to Man.

A suggestion is mooted, not as an argument but as a plea, for the engineering and establishing as considered imperative, a NEW FACULTY OF ENVIRONMENT-EARTH by drawing components from the relevant disciplines and sub-disciplines, and from other major disciplines and faculties with special importance to those which are concerned with—*KSHITI, AB, TEJ, MARUT, BYOOM*—earth, water, energy, air and atmosphere.

The author has hinted at the possible components of the curriculum, courses and syllabii.

## 33. AN INSTRUCTIONAL MODEL FOR ENVIRONMENTAL EDUCATION

RANJIT K. BANERJI
*Professor and Head of the dept. Architecture and Regional Planning, IIT, KGP.*

Traditionally, the prime goal of all users of environment has been to maximise their gain from whatever pursuits they follow. In this process the interest of various groups of users, very often, are in conflict with each other.

Attempts have been made by local, state and federal agencies to resolve these conflicts by measures which range from punitive in nature to monetary incentives. Very little emphasis has been laid or attempt made or even suggested towards bringing about an attitudinal change in the users of

environment. It is contended that developing a positive attitude is a prerequisite to achieving acceptance of or cooperation in applying environmental controls.

Based on the above contentions this author and some of his associates have attempted to develop a process for educating one group of users of the environment—the home builders.

The techniques developed here can be effectively used with other users of the environment with necessary modifications in the instructional material.

## 34. ANTHROPOLOGY AND ENVIRONMENTAL EDUCATION

S.L. MALIK
*Dept. of Anthropology, Univ. of Delhi, Delhi-110007*

Malthus discovered that the population size increases in geometric progression where as food production increases in arithmetic progression. However the populations do not grow limitless, the environmental constrains do not allow them to grow beyond a limit technically called as carrying capacity. This carrying capacity is determined biologically for the animals except man. An extra somatic dimension of culture plays a significant role in case of man who through the technological development are also in a position to increase even the carrying capacity so as greater population size can be supported in the same area But of course there is a limit beyond which population can not be supported by the environment. In doing so, however, it exploits more and more the environmental resourcess, of which it is possible to replace resources but not the non-renewable ones. As the non-renewable resources are the chief sources of energy it is important either to find out alternative source(s) of energy or limit the use of these sources or face the danger of crash of population.

While on one hand culture is the adaptive force to the environmental stress on the other it also increases the stresses such as water pollution, air pollution, noise pollution, increase in density dependent diseases with which all of us are well familiar with. Worthy of being consideration is that at the same time culture through its unique process of learning (extrasomatically) not only allows us to understand the deterioting conditions but also organise ourselves (as this international conference) to amend or restrict our activities to help any further deterioration of the environment as also to improve it. The role of anthropologist is extremely significant as man should best be understood in its combined bio-cultural concomitants. Environmental education can be best imported only after knowing the human nature on which anthropology claims to focus its attention.

## 35. IMPORTANCE OF INTERDISCIPLINARY RESEARCH PROGRAMMES IN ENVIRONMENTAL PROBLEMS

M.L. DALAL, V.B. CHOUDHARY and S.P. DAVE
*S.N. Govt. P.G. College, Khandwa, (M.P.) 450001*

Environmental science can be defined as a science of the things surrounding all living-beings. It is a very diverse field and includes the study of air, water, energy etc. Because of increasing industrialisation and growing urbanisation, the environment is polluted drastically. The polluted environment affects the man, animal, plant, soil, and buildings. Each of these affected and affecting factors conforms a separate science and has been and is still being studied as an individual event. But since there are always two or more than two factors associated with any event of environmental pollution it is strongly urged that a co-ordination between these sister-disciplines be made so that the effects of the environmental pollution can be reduced and rational standards can be established. The co-ordination between the sister-disciplines must be encouraged and promoted with a view to enhance the

utility of the specialized persons of the indepentdent disciplines to study the problems of environmental science. These inter-disciplinary research investigations will safeguard the health of the human beings and the rich heritage of the country.

## 36. ENVIRONMENTAL SCIENCE: A SEPARATE DISCIPLINE AND ITS CURRICULUM.

L.B. JHA, S.R.K. VARSHNEY, B.K. TEWARY
*Jawaharlal Nehru University, New Delhi-110067*
MOHAN JHA
*All India Institute of Medical Sciences, New Delhi-110029*

The unprecedented public and academic concern over environmental problems has lead to the birth of a new discipline to deal with, what is called Environmental Science. Environmental science can be defined as the study of environment, interaction of its different components (natural and man-made) and its management. It is based on basic sciences which are the tools for studying it. It is interdisciplinary in nature and based on the national as well as global environmental problems.

At primary and secondary level, the fundamentals of environmental science should be incorporated into individual disciplines. This is for the formal education system. For non-formal education, the local environmental problems should be included in different programmes like adult education, agriculture extension, family welfare, cultural programmes etc. Various mass media can also play an important role in this. There sh ould be a national compaign for environmental awareness which government department can also do with the help of voluntary organisations.

Based on the above philosophy a curriculum has been proposed for university level, whose orientation is towards

environment, environmental problems, its control and employment. Details of which will be presented.

## 37. ENVIRONMENTAL EDUCATION FOR THE UNDERGRADUATE STUDENTS OF A UNIVERSITY IN INDIA

L.N. VYAS, R.K. GARG and S.K. SANKHLA
*Department of Botany, School of Basic Sciences and Humanities, University of Udaipur, India.*

The economic growth and technological progress, while bringing benefits to many people, have caused severe social and environmental consequences. For raising own standard of material living, man when seen in the biospheric context today, has had apparently gone too far away in showing a disregard to the inextricable relationship of environment and human population on this planet. This wrong is now tried to be corrected by emphasizing the environmental concern. A goal of education today requires a better understanding of the environment for guidance of human action in the coming times. The education could be conceived of as a process through which individuals become aware of their environment and of the interaction among its biological, physical and socio-cultural elements.

Sprouting in the soils of Rajasthan, the University of Udaipur ventured a thought for environmental studies for undergradate classes to start with. Environmental studies being of interdisciplinary approach, a committee of experts in basic and social sciences and humanities was constituted to draft the academic programme. This committee recommended to start an optional qualifying course to be taught at second year level of three year degree course in all the faculties. The detailed syllabus has been worked out. To provide practical experience the course suggests to take the students to affected areas.

## 38. INTEGRATION OF ENVIRONMENTAL EDUCATION IN TO THE CURRICULUM OF HIGH SCHOOL

DEEP PUNIA, RAM KUMAR PUNIA
and SALILESH DARSHAN
*Dept. of Sociology, Haryana Agriculture Univ., Hissar*

Two decades back pollution and other environmental problems were considered mainly the problems of industrial countries. Rapid industrialization, modern means of raising living standards and comforts have posed a great danger to our society.

The stockholm conference held in 1972 drew attention to the urgency of tackling environmental problems through various efforts. The Conference pleaded that new evironmental education must be broad based and strongly related to the basic principles outlined in the united Nations Declaration on the new International Economic Order.

In this paper need for evironmental education in schools has been emphasised and an attempt is made to integrate the components of environmental education into the curriculum of high schools. The objectives of teaching methods applied in high schools have not been altered, but in accrodance with the premises like learning language, general science, mathematics, history, geography, drawing, biology etc. and example of integration of environmental education in each area of teaching is presented.

## 39. AWARENESS VERSUS EDUCATION ON ENVIRONMENT

S. SINHA-ROY
*Centre for Earth Science Studies, Trivandrum 695010*

Some environmental issues as the use of natural resources at the cost of environmental quality for necessity and progress

are subjective and hence, debated, but the degradation of the environment per se and the preservation of the natural balance and quality of the evironment are universal issues on which scope of disagreement is limited. In India and in many developing countries where socio-economic contrasts and gaps between people are prominent, the environmental issues have many facets.

In terms of awareness of environmental problems, their course and consequences, two major categories of people exist, namely, people unaware of nuances of environment and people aware of these. The unaware category, by far the majority, is the so-called uneducated and unelightened class. This category of people need education on impact of evironment on their existence and made environmentally conscious.

The category of people who are aware, the so-called educated and the enlightened class, offer complex problems vis-a-vis environmental issues. This category can be divided into four sub-classes in terms of their exposure and reaction to environmental issues. These sub-classes are, (1) aware but oppsed to importance of evironmental considerations, (2) aware but undecisive of reaction, (3) aware but unconcerned, and (4) aware and concerned.

The environmental education for sub-class 1, 2, 3, would require a mechanism of reorienting their views in pragmatic lines with proper environmental perspective, and of making them realise the critical state of fragility of many environments. The responsibility of doing this, and of making the whole nation environment-minded and environmentally educated lies with the sub-class 4, namely, the aware and concern ed people at various levels.

## 40. THE ROLE OF THE HUMANITIES IN INTERDISCIPLINARY ENVIRONMENTAL EDUCATION

DR. ARTHUR B. SACKS
*Administrator of Academic Progams, Institute for Environmental Studies, Instructional Program, University of Wisconsin, 70, Science Hall, Madison, WI 53706, U.S.A.*

Attitudes, values, ethics, and qualitative, non-quantifiable matters of judgment shape both the conscious environmental decision making process and unconscious societal and personal forces that shape human impact on the environment. Studying the cultural artifacts of a society-literature, art, film-and exploring the basic paradigms that underpin a culture—religion, belief structure, world view—provide essential elements for understanding complex environmental problems and help chart the course for developing solutions to them. The humanities play an important role in understanding the nature of the modern environmental crisis and have a place in interdisciplinary environmental studies curricula at college and university levels. Further, environmental awareness among the public may be enhanced by drawing upon humanities (e.g. art in its many media and genres) applied to public education and public information and communication projects.

## 41. INSTITUTIONALIZED DISCONTENTMENT AND A CASE FOR SIMPLICITY

SEHDEV KUMAR GUPTA
*Man-Environment Studies, University of Waterloo, Waterloo, Ontario, Canada, N2L 3GI*

In all modern societies, whether socialistic or capitalistic, and developed or developing, there is a growing distance between the quality of life and the material developments. With contemporary faith in 'progress', there is an implicit assumption that all other evolution, such as in the realm of the spirit, will follow physical changes. The basis for man's

striving, in such situations, is assumed to be located in his being discontended with his lot.

This paper examines how environmental ethics must ultimately be located in spiritual concerns, otherwise it will burst open at a thousant different places every time it is repaired.

## 42. TREATING ENVIRONMENT AS A SYSTEM OF ALTERNATIVE EDUCATION

G.S. PURI
*36, Merrilocks Road, Blundellsands, Liverpool, U.K.*

In the human ecosystem all the spheres of natural phenomenon, namely the lithosphere, the hydrosphere, the atmosphere and the biosphere converge to produce an environment that in interaction with human urban and industrial activities, using heavy technology produces a complicated meshwork of a complex nature in which manmade spheres like the mineralosphere, technosphere, noosphere and even the spatosphere quite perceptively make their presence felt. Both the matter and the energy resources of diverse dimensions whether produced in the natural way or by the hand of man and when convertible into practicle knowledge, constitute yet another factor of eminence of the environment in the ecological sense. The modern man in a short space of time has developed ecology originally a mere view point or a subject of plant or animal studies into an Eco—Science; a wholistic complex pyramid embracing the whole universe.

Environmental education thus cannot be contained in the present pattern of education either as a subject or subjects; or even in a formal or informal teaching programme or a department or faculty, but being a wholistic practical knowledge it has to be adopted in its totality as a system of *Alternative education*—quite apart from the traditional systems already in

vogue. It cannot be fitted into the 3R education pattern without damaging both the systems of education and producing a confused matriculate or a graduate.

Separate institutions have to be developed starting from the primary, through secondary to the university teaching in which suitable dosages of practical work experience in field, factory and family are to be sandwiched at properly planned art stages, every three or four years period so as to be extending the total period of education by another four to five years for producing a professionally qualified personnel capable of tackling multiple problems of environmental degradation, its preservation, up grading and conservation in the rural, urban, industrial and recreational sectors—treating them in an ecosystem. The paper discusses the practical philosophy of the Alternative Education, here proposed, for the Third World countries to rapidly educate their masses in the essential strategy to develop environment without destraction to deal with problems of material poverty, mass illiteracy, human unemployment and under-employment, malnutrition of man and cattle, planning of family. urbanisation and industrialisation, etc. with waste and pollution threats. Recycling is the means and the end.

## 43. ECOLOGICAL BASIS OF ENVIRONMENTAL EDUCATION

R.S. AMBASHT

(*Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi-221005, India*)

Environmental education has become imperative at different levels, to youngsters in schools and colleges, to serious researchers in universities, to grownups in the villages, towns, industrial colonies, city slums, multiflat crowds and posh locality residents alike. There has been a hue and cry about pollution, dwindling wildlife and disrupting ecological balances. Unfortunately, there are a whole lot

of confusions and misconceptions also generated and we have to safeguard ourselves against them and create correct ecological perspectives among all class of people. There is a general lack of proper understanding about environment, natural resources, conservation and protection of biotic and abiotic components, etc. To environment, people immediately relate problems of pollution; and to conservation as opposite to technological development and a ban on utilisation of natural resources.

This paper examines some of the principles and concepts of ecology that should form a basis of environmental education at different levels. After a basic education at school level about the physical and biological environment at regional level, a dynamic picture of ecological balance, homeostasis, resilience, community dynamics and succession, climax etc. should be taught at plus two (pre-university) level. At the university level new knowledge generated at global level should constantly be incorporated in the critical assessment of new concepts and the fundamentals of ecological modelling, use of computers and statistics in ecology, predictive ecology, conservation and management practices, sustained use and maintenance of ecosystems, should be taught. Serious researchers should be encouraged to work on applied ecology with definite aims and very carefully and completely planned experimental and field designs. A technology which allows development, affluence and prosperity without damage to environment and ecosystem productivity on a long range basis has to be evolved. Alternatives to non-renewables are to be discovered.

## 44. ROLE OF R & D INSTITUTIONS IN ENVIRONMENTAL EDUCATION

B.B. SUNDARESAN
*Director, National Environmental Engineering Research Institute, Nagpur, India*

Institutions involved in research and development in the

area of environmental sciences and engineering focus attention on inter-disciplinary approach to critically analyse and indicate scientific methodologies to minimize environmental damage. Technological processes and engineering skills could them be adopted to provide practical solutions for field problems as they emerge out of developmental activities. A number of institutions and government departments are involved in various aspects of environment in India. The role of R & D institutions in environmental education is limited in scope through appreciation courses for professionals involved in policy planning, decision-making and managerial levels. Short courses for academic personnel at the universities and colleges would prove beneficial for further exposure of students to environmental issues.

## 45. ENVIRONMENTAL EDUCATION—METAPHYSICS AND INTEGRAL EDUCATIONAL STRATEGY

J.S. RATHORE
*School of Environmental Biology, Dean, Faculty of Life Sciences, A.P.S. University, Rewa*

Earlier Beryl Crow (1969) has summarized excellently, what can be called as *helplessness syndrome* faced by contemporary human society. In the words of Bery Crow:

"There has developed in the contemporary natural sciences a recognition that there is a subset of problems, such as population, atomic war and environmental corruption, for which there are no technical solutions. There is also an increasing recognition among contemporary social scientists that there is a subset of problems, such as population, atomic war, environmental corruption and the recovery of a livable urban environment for which there are no current political solution". Further, "This society, with its emphasis on differentiation and specialization, has led to the development of two insular scientific communities—the natural and the social—between which there is very little communication and

a great deal of envy, suspicion, disdain and competition for scarce resources." Since population, atomic war, environmental corruption and urban habitat are fundamentally environmental problems, integration of relevant environmental themes in the formal and non-formal educational structure appears to be the only alternative to bridge this communication gap between the two insular scientific communities.

In his famous book *Small is Beautiful*, E.F. Schumacher (1973) pointed out: "The modern world has been shaped by its metaphysics, which has shaped its education, which in turn has brought forth its science and technology". Further, "It tumbles from crisis to crisis, on all sides there are prophecies of disaster and indeed visible signs of breakdown."

Scientific materialism, which is the currently dominating theme, has encroached and transformed our systems of education. The modern technology of exploitation and conflict is the outcome of this education. A human mind shaped by this education treats man as a product of material interaction thinks that everything is within its power and has an attitude characterized by the desire to lord it over nature. It is this materialistic vision which has placed man at war with nature and has resulted in alround collapse of human values.

This paper presents environmental education not as a patch-work solution but as an alternative model with its more sensible and logical vision of man's relationship with nature and with a potential to revolutionize our systems of education and ability to produce new benign technologies.

## 46. A LEARNING EXERCISE IN ENVIRONMENTAL EDUCATION: THE STUDY OF HUMAN SPATIAL BEHAVIOUR THROUGH ENVIRONMENTAL PERCEPTION

S. SHANMUGANANDAN,
*Dept. of Geography, Madurai University, Madurai Tamilnadu*

The concept of environmental perception is used to mean human awareness and understanding of the environment in a normal sense. The environmental perception is generally concerned with an emphasis to understand the man-environment relations as a function of man's perceptions.

The modern urban environment is a complex one where numerous elements of the real environment shape or alter the images. The word 'image' in the urban environment has social and physical components which are influenced by historical, economical and cultural factors. The perception studies lead as possibly to explore the human spatial behaviour through mental representations of reality construed from their knowledge and experience rather than of objective reality. This involves people's attitude towards resources and the interaction between the attitudes of the individuals and their culture; application of environmental psychoiogy and people's information about the environment and their attitude towards space and elements of the environment. In this context it is to state that cities develop strong individual images and exhibit correspondingly specific perceptions. This influences the human spatial behaviour in a wider context.

The purpose of these studies is important to bring out the differences between the real and perceived environments and to construct a realistic model to express and explain the man-environment system and the mosaic of relationships actually lies in the web of the system.

The present research study mainly aims at how best the realistic scientific generalisations can reasonably be made out

about the urban environment of Madurai city in terms of,

1. City environment as observed by the urban residents
2. Rhythms of adaily urban activities of residents and their perceptual spatial choice of residences as revealed from the spatial preferential pattern of residential areas
3. To understand the quality of urban life from their perceptual experience
4. To analyse the human spatial behaviour of the urban dwellers as understood from their perceptual variation levels
5. To determine the travel behviour through the perceptual variation noticed in major environmental components such as space, time and distance.

The above research work is principally concerned with aiming at the actual or real picture of the urban environment of Madurai city from the apparent images. The scope of the study envisages to draw out the scientific generalisations in order to identify major problem areas.

## 47. IDENTIFICATION OF PSYCHOLOGICAL, CULTURAL AND PHYSICAL MATERIALS FOR ENVIRONMENT EDUCATION

BISWANATH ROY

*Reader in Psychology, NCERT; New Delhi-110016*

The objective of the paper is to identify psychological, cultural and physical conditions useful for the development of training and curriculum programmes for EE. The psychological conditions are *personal* to the individual, the cultural conditions are the products of his mobility for his *social* expansion and the physical conditions are always *natural* to him. Materials based on the above three are supposed to make the children more aware, alert and active about the conservation of the self, the culture and the nature.

The psychological materials are principally associated with the overt behaviour of the person and its covert reasons as associated with motivational aspects. Studies on *life styles and behaviours* of inividuals, are helpful in discovering the psychological environment in which the individual lives. This is necessary for the purpose of adjustments for an effective living. Adjustments are possible through development of tolerance and other psychological defences. These are divided into three areas: (1) Cognitive or intellectual aspects (2) Affective or emotional aspects (3) Aspects of ego functioning related to ego strength, conflict areas, defences. The ego functioning can be traced to visible terms as overt behaviours. As a result, there can be behaviour isolation and behaviour development. This paper has suggested 20 such overt behaviours.

Culture can be defined as *a way of life and living* in a total culture spectrum. The cultural materials can be traced into performing arts, philately, physical appearance, religion, religious beliefs, attitudes and practices, food habits, dresses, languages (spoken and written), methods of survival and growth. These are supposed to educate the learner about his cultural habitat.

The physical materials are task-achievement dimensional, nomothetic or institutional. These include the sensory parts, work study, fatigue and sanitation problems. Conservation of nature (trees, birds, animals) also come under this. The message is that life in any form is precious and needs optimum care.

Thus there can be a triadic framework of environment education for the development of the individual through a culture bound quality in life and value, free from arbitrariness.

## 48. POVERTY AND ENVIRONMENT

K.K. KHATU and A.R. D'SOUZA
*Operations Research Group, Baroda-390007*

Poverty is a relative term. Poor and backward countries may not be necessarily poor in resources (content) and also conservative in their attitudes. While rich countries may not be always rich in resources and perfect in technology. The poverty therefore needs to be defined properly. The term environment, too is very vague and expansive. It encompasses everything under the sky i.e. micro and macro environment. Behaviour of a micro organism in its smal world and the mother earth as a spaceship, both could be the subject matters in environmental analysis. Moreover, the terms poverty' and 'environment' are normally used to convey the quality perspective, rather than the quantitative assessment. Therefore, the choice for scale of measurement as well the relative significance of one situation vis-a-vis the other have always been difficult in environmental comparison.

The lack of resources and their proper inventory, inadequacy of technology, limitations of politico-administrative systems, social and cultural factors and above all the poverty of thoughts, are some of the aspects of poverty. The 'environment' that emerges through such situations is obvious and not hypothetical. The environmentally poor or environmentally rich are the expressions understood in context of the levels of technology achieved, the direct impacts that are noncongenial to human life, the community's ability to pereive and more importantly the alternatives available at a given time point to society. The paper attempts to put forth the ideas that are becoming more obvious as we are grasping the totality of interdependency of environmental subsystems. What is worrying the thoughtful minds, is the continued impoverishment of the environment and that is true, as a result of our poorly developed structures of international understanding and action. Finally, though it is difficult and premature, it attempts to indicate the probable directions of actions and upcoming seams of structures that may lend some help

to negotiate the environmental problems in more satisfactory way.

## 49. PRESERVING THE QUALITY OF LIFE—FROM AN ECOPHYSICAL POINT OF VIEW

B.C. PANDA

*Division of Agricultural Physics, Indian Agricultural Research Institute, New Delhi.*

Physically speaking living systems are characterized by their ability to create and maintain an internal state of low-entropy or high themodynamic order. Thus necessarily life can be taken as a property of an open themodynamic system which exchanges energy and matter with its environment. The living systems are composed of atoms whose entropy is lower in the system than the entropy of the same atoms when they were originally in the environment. While trying to create and maintain high internal order, a living system interacts intimately with its environment and with other living systems. This act of living alters the environment rather slowly. Man, for the sake of more elaborate and comfortable living, has been changing the environment rather rapidly. Ecophysically speaking, man made machines and devices are responsible for polluting the environment, making it unsuitable for other living organisms. Under these circumstances, the present paper discusses the various physical factors characterizing the quality of life and suggests measures, on the basis of symbiosis between man and machine, to preserve this quality.

## 50. ENVIRONMENTAL EDUCATION AT THE SCHOOL LEVEL

B. SHARAN

*Head, DSME, NCERT, New Delhi-110016*

This lead paper has three sections. The first section, while dealing with the emerging trends in environmental edu-

cation (EE) starts by describing the Vedic Period. It then describes, in the international context the emergence of EE as a distinct entity in the 1970s. The guiding principles, definitions for EE, and the alternative models for patterning the EE curriculum are next discussed. At the end of the section is given the status of EE in the national context.

The second section on 'Implications of EE' first discusses the implications of the development of EE curriculum in formal education, It covers such aspects as: formulation of objectives, teaching-learning strategies, preparation of instructional materials including teaching aids and a.v. materials, evaluation and teacher preparation for EE. The second part of this section deals with the curriculum development for EE in non-formal education (NFE) presenting such aspects as salient features of NFE in the context of EE curriculum development, process of curriculum development, objectives of EE and a competency model for NFE with environment oriented need-based approach. The section also discusses the role of community and other agencies. The contribution of NCERT to EE through instructional materials, different projects and programmes are presented in the next part of this section. The section ends by presenting the constraint and difficulties in the implementation of EE.

The third section gives very brielfy the future perspectives of EE. Starting with a global view it presents at the end a model institutional framework for EE implementation in the country.

## 51. A SURVEY OF ENVIRONMENTAL ATTITUDES OF TEACHERS FROM WESTERN REGION

S. MISAH

*Regional College of Education, Bhopal*

Environmental attitude of 102,106 and 70 inservice secondary school teachers admitted to summer school cum corres-

pondence course of Regional College of Education, Bhopal in the year 1979 and 80 were administered on Likert type Environmental attitude scale prepared by the investigator.

On the whole, it can be concluded that respondents had positive attitude towrads environment. In few cases they were undecided because, may be they did not know whether noise pollution water conservation and land scarcity are problem of India or not. They had positive attitude towards population problem and agreed that population education and environmental education should be included in the curricculum. High percentage of respondents had positive attitude towards pollution problem and conservation of natural resources (wild animals, soil, energy and forest).

## 52. THE ROLE OF ELEMENTARY AND SECONDARY TEACHERS IN ENVIRONMENTAL EDUCATION

ARMANDO A. DE LA CRUZ
*Mississippi State University, Mississippi State, MS 39762, U.S.A.*

The teaching profession has always been and still is founded on idealism. A new rallying point in the new idealism can be the concern for the environment. Every elementary and secondary teacher should make Environmental Education permeate all school activities. Make the outdoors a teaching laboratory to promote respect and love for nature; make classroom experiences relevant to the environment; sing environmental songs in the Music class; write about the environment in Language Composition; and use sentences about the environment as examples in Grammar class. Talk about organic gardening and organic food in Home Economics, and about the destruction of the ozone layer due to the underarm spray a physics student used before coming to class. The present is not the end of History, thus, the history teacher should project events to the future and should pro-

voke the class to wonder what the earth would be in the year 2000.

Environmental education is a philosophy of education that will reflect a way of life imbued with concern for the quality of environment and a idealism based on the fundamental concepts of ecology.

## 53. ENVIRONMENTAL EDUCATION IN COLLEGES AND SCHOOLS—SCOPE FOR IMPROVEMENT IN TEACHING

**SHASHI KANT**

*Department of Bio-Sciences, University of Jammu, Jammu-180001 (J&K), INDIA*

Environmental Education in India is yet in a juvenile stage but all the same it has been widely acclaimed and accepted throughout that environmental complexes and their interactions with and within the ecosystem of which man is an integral and most vital component, play quite a significant role for the human welfare. While we admit that a considerable research in this field has been initiated and completed in this country, we must also admit at the same time that no serious effort has been undertaken to teach this science in school, colleges and even at the post-graduate level. It has not been included in the most of the graduate syllabii of Indian universities. However, whatever teaching is there in most of the institutions, it has been confined to the four walls of the class-rooms. The field studies and the environment in the natural habitats even at this level has been either totally neglected or very poorly taken up with the result that the students find themselves misfits when they confront the problems in the field. While we are launching projects both at the national as well as internatioal level to study the effects of environment, pollution, and many other ecological parameters, it is high time that we channelize a bit of our resources and energies to the teaching of Practical Environmental Educa-

tion, if we really mean to popularize this science, if we really want to make people understand about their environment and their own role to preserve it for better living and better resources, we really want to serve humanity. Some methods to achieve these goals through teaching this science in natural habitats have been discussed in this paper.

## 54. ENVIRONMENTAL EDUCATION THROUGH AERIAL PHOTOGRAPHS—EXPERIENCE WITH DEHRA DUN STUDENTS.

P. MISRA, G. BEHERA and S.K. SUBRAMANIAN
*Photo—Interpretation Institute, Dehra Dun*

This paper highlights how student community studied the environment through the technique of photo-interpretation to assess qualitatively and quantitatively, degradation of physical environment. The students in the age group of 15-17 from schools of Dehra Dun were selected as a target group for the study of environment around Dehra Dun. About thirty case studies pertaining to various fields like forestry, landslides, soil erosion, improper mining, landuse and impact of crowded industrialisation were analysed by them and physical verification of deterioration with respect to past was evaluated by them in selected test areas mostly around Doon valley.

The inferences drawn by the participants form their theoritical and practical knowledge by using the aerial photo-interpretation techniques were presented in the from of posters in an exhibition which was seen by many citizens of Dehra Dun. The appreciation received prompted the Indian Photo-interpretation Institute to introduce week-end courses for school children of younger age group i.e. 6th to 8th standard. This week-end course with short lectures and one day field work on environmental studies also received good response. Subsequently one day basic course on environment was also organised by Indian Photo-interpretation Institute for school teachers of Dehra Dun to disseminate the knowledge to younger gencration. On the basis of response to such courses

it is recommended that environmental studies using aerial photographs may be included a part of school children curriculum.

## 55. ENVIRONMENTAL RESEARCH IN UNIVERSITIES

R. SUBRAMANIAN
*Centre for Env. Studies, College of Engineering, Guindy, Madras-600025*

Environmental research is inter-disciplinary in nature, wherein social scientists interact with scientists. Environmental research in Indian context is primitive and lot has to be explored. Social Scientists can contribute to the research in exploring social impact of change in environment. But major role has to be played by the scientists. Areas of research, as air, water and soil pollution, its monitoring and control, environmental instrumentation and technology, energy usage, settlement planning, pesticide studies, environmental education, ecological impact of change in environment on biosphere, are a few vital to be studied in depth.

With the existing laboratory facilities of the various departments of the universities and its affiliated colleges the above areas of research could be taken up then and there and solutions be found.

The role by the various departments of the universities and affiliated colleges in environmental research areas, in terms of methodology etc. has been discussed. Suitable examples are cited.

In addition, universities with its infrastructure of faculty, staff and students can impart teachings to mass of people, on environmental conservation, nature education, humaa settlements, human environment in relation to population growth and economic development etc. They can impart regular training for Environmental Managers Besides, universities can create public awareness of environmental problems through conferences, seminars, symposia or any other means.

## 56. HOW ENVIRONMENTAL AWARENESS MAY BE GENERATED AMONG SCHOOL CHILDREN, COLLEGE YOUTHS AND GENERAL PUBLIC

**INDRA KUMAR SHARMA**

*Bhagwati Bhavan, Ratanada Road, Jodhpur-342020, India*

Indian culture and traditions have been nature and environment conservation oriented but for few decades with increase of western materialism tendencies, people began to turn ruthless with nature for its exploitations. My 5 years observations on sentiments and actions of people of various age groups with environment revealed that teachings at home by parents to their children below 12 years is very deep and lasting—their learning to be merciful to plants and animals lasts for most of the life. Teachings of such moral education in primary schools upto the age below 12 years is notably deep and lasting, then on attaining adolescent age from 14 to 18 years, environmental education is more effective if it is thorough science degree syllabus having practical training and examinations and by youth clubs with nature teaching cum eco-development field camps. Essay and debate competitions on nature with handsome awards very much attract and stimulate youths for nature consciousness. Grown up people are much impressed by illustrated articles on nature conservation in sunday magazine supplements of newspapers and popular magazines, such television programmes or documentary films are also very impressive to youths. Rural area radio

and television programmes and talks on need of environment conservation are also effective provided these deal with respective local problems of regions. Nature conservation clubs and societies with cooperation of religious and social leaders have much impact on the people of villages and towns. Economical tours to charming sancturies and national parks may considerably motivate and promote nature conservation tendecies of people. .

## 57. ENVIRONMENTAL EDUCATION FOR THE UNDERGRADUATES

M.S. MUDRIA

*Deptt. of Chemistry, Udaipur University, Udaipur*

Environmental education is essentially interdisciplinary and is expressive of appreciation of interrelatedness of social, cultural, political, economic and technological awareness in man with the geologic, atmospheric and biological systems of nature. It is therefore desirable to have a conscious learning of this relatedness at all stages of formal education. The traditional faculties of a university have therefore to be grouped together in a school system for imparting the environmental education. It has to be an interfaculty or a supra-faculty programme.

The current society being science and technology hased, the benefits accruing and the limitations imposed on the human thought and action by these has to be a conscious learning of the university undergraduates. Science and technology, as are generally understood, are the product of advancements made in the realm of physics and chemistry; manifestive of studies in the derived form, physiochemical environment. Vegetation and animal world is no less important for the survival and happiness of human life. Studies of the biological organisation of the planet earth, and the biosphere have therefore of late acquired greater significance. Human ecology is emerging as a discipline to be included

in the faculty of social sciences. Notwithstanding the rise of anthropocentric disciplines what is noteworthy is to recognise the biophysical environments as an entity, as a unit—needs an understanding by a greater number of university students. A student crossing the secondary level in persuit of liberal education in a centre of high learning cannot and need not remain satisfied with a fraction of total knowldege needed for healthful living. In the developing country like India they go about job seeking. It is for these undergarduate students for whom the first degree course is a terminal education that the environmental education is a needed programme.

Environmental education leading to a comprehension and a capacity for evaluation of local and wider issues by the individuals and groups would largely determine the stage and speed of economic and community development of a country in the present as well as in the future. The issues such as family planning, energy crisis, small scale industries, employment opportunities and more leisure to the working people—are all, in some way or the other related to environmental under-standing.

In India environmental concern is made evident through 1) air pollution legislation 2) work of water pollution boards 3) interdisciplinary studies being undertaken in arid zones, semi-arid zones and the Himalayan region 4) conservation practices which are now receiving greater increased attention, and 5) activities of institution like NCERT and NCEPC.

For a vast population that India has, a vigorous drive for environmental education, both formal as well as informal is very necessary. Environmental education at the primary to the secondary level is being planned and promoted by the National Council of Educational Research and Training. The university intellectuals appear to be agreed for the introduction of environmental courses in the specialist-professional postgraduate programmes and for promoting environmental research.

It is hoped that the environmental studies shall gradually

evolve with teacher's orientation and integrated material coming up into more and more broadbased and integrated programmes.

## 58. ROLE OF EDUCATION GENERATING AWARENESS OF ENVIRONMENTAL PROBLEMS AT OUR PRE-SCHOOL LEVEL

Y.G. PARTHASARATHY
*Padma Seshadri Bala Vidya Bhawan, Junior College, Madras-34*

Based on author's observation are listed various ways by which environmental awareness can be inculcated in pre-school children.

1. Creating awareness of the environment around them through sight, sound, touch, taste and smell. Play-way methods by which basic understandings can be developed through the five senses to appreciate environment around. For example, go for walk, collect plants, shells, insects. Can look for different birds, pests and classify them.

2. Group activities—Games, mime and creative drama on birds, animals, trees, plants etc.

3. Organising field trips to farms to learn about farm, animal, study of pests etc.

4. The study four seasons and the changes in plant and animal life during these seasons. The changes that occur during these seasons.

5. Celebration of festivals connected with environment preservation like Vanamagotsava, spring festival like Pongal etc., arranging picnics and visits to farms, zoos, etc.—drawings and paintings.

6. Through stories and legends involving plants, vegetables, trees and animals that will develop an appreciation for their environment at an early age. Training in conservation of energy.

7. Poems and Songs relating to environment. What children can discover through exploring science.

8. Parents and teachers role—in developing a sense of responsibility in preservation and conservation of environment right from early child hood.

## 59. AN EXPERIMENT IN IMPLEMENTATION OF ENVIRONMENTAL APPROACH AT PRIMARY LEVEL

J.S. RAJPUT, A.B. SAXENA and V.G. JADHAO
*National Council of Educational Research and Training, Regional College of Education, Bhopal 462013, India*

The paper presents the experiences gained in developing instructional materials at primary level with the help of primary teachers, suitable to their own local environment. The class-room testing of this material and subsequent renewal has been analysed with a view to test the efficacy of the environmental approach. The study conducted on children of classes III and IV of two schools of Bhopal city reveals that the environmental approach does increase the environmental awareness and has more bearing to successful teaching. The implications of the results have been discussed in the broader context of implementation of environmental approach in the Indian school situation.

## 60. STATUS OF FRESHWATER ECOLOGY IN INDIA

S.A.K. NASAR
*Department of Zoology, North-Eastern Hill University, Shillong-793014, India*

The foremost aim of developing countries is to meet the basic human needs for their populace, to obtain an equal

share of the world's wealth and to maintain economic stability. Achievement of these socio-economic gains depend on wise exploitation and preservation of natural resources, and in this context development and utilization of fresh water resources are of utmost importance.

Today, many voices claim that sufficient researches on fresh water ecology have already been carried out, and all that is now needed is to apply existing information in solving the resource-management problems faced by different developing nations. But on the other hand, our present day knowledge is unevenly distributed and most of the available data by their very nature, are not properly applicable and are of little or no help to policy-makers in shaping the programmes for endogenous development.

Based on the experiences and from the existing knowledge, it has been endeavoured in this paper to justify that available data are not sufficient and much needs to be done to make them more sound and widely applicable. Hence, to accomplish these objectives, a three-fold approach is suggested. Firstly, further basic work on the structure and function of fresh water systems has to be done intensively on a regional basis. Secondly, the response of perturbations needs to be studied. Thirdly, environmental monitoring programmes need to be developed. Also introduction of extension services and mass revision of syllabi at all educational levels to extent of citizen's awareness to the importance of fresh water environment is needed. This may lead towards the development of a healthy outlook for freshwaters. Thus, the key to the problem is 'exploit fresh water resources wisely to utilize them more widely'.

## 61. STRATEGIES FOR USING EXTRA-CURRICULAR ACTIVITIES IN SCIENCE FOR SPREAD OF ENVIRONMENTAL EDUCATION

SHAKUNTALA BHATTACHARYA
*DESM, NCERT*

This paper explores the possible strategy of using extra-curricular science activities to create an environmental awareness amongst children in particular and the community in general. School science clubs, of which, according educational survey reports there are 10,000, have been suggested as a base for spreading environmental education, through long-term projects. Interaction, of the community members with the science clubs are discussed, with the clubs visualised as a bridge between knowledgeable members of the community and the general public. Roles of science exhibitions such as the National Science Exhibition for Children and its counterparts the state level exhibitions for creating awareness among the participants and the viewers have been examined. It has been suggested that to create a greater impact there should be a sharper focus in the themes of all science exhibitions for children. The problems of implementation has been discussed to resource persons.

## 62. EDUCATION IN LANDSCAPE ARCHITECTURE

JASWANT RAI
*Professor & Head of the Department of Landscape Architecture, School of Planning & Architect, New Delhi-110002*

The profession of landscape architecture is concerned basically with planning and design of the outdoor environment. This is an enormous domain, yet the profession is a small one in this country—about one twentieth the size of the architecture professsion and one tenth of the city planning profession.

With a shift in the traditional roles of the landscape architects in the field of site, open space and park planning to large scale urban planning and with heavy emphasis on ecology and ecosystem analysis, a new generation of younger men are coming into the schools and the profession from planning and other disciplines.

Today, the ecological crisis is demanding that we take a second look at what we are doing to the natural environment. What appeared to be right at one time is often found wrong today. A visual appreciation of the landscape is not just enough. Therefore, the landscape education programs must commit to give students an indepth knowledge to a greater extent than it is being given today to understand natural ecology and the impact of environment upon it. Nature, instead of being treated merely as an aesthetic projection, which happen more than often in educational programs of many schools, must be understood as an ecological system. Yet, another committment in landscape educational programs would be of resources and new mixex of disciplines. The interdisciplinary nature of the program would demand a greater coordination and colaboration among various departments.

The academic institutions main task is not simply to impart education but it is to impart intellectual education to train students to become leaders in their chosen fields. The institution must produce the capacity not only to learn but to *re-learn,* not only to discover the new but to be critical of what already exist. Without a learning image, the teaching image will be dead. This fundamental principal should be the major yardstick against which an educational program in landscape architecture should be measured.

## 63. ENVIRONMENTAL EDUCATION IN TEACHER TRAINING PROGRAMMES

M.V. RAMJI and A.L.N. SARMA*
*PG Dept. of Life Science, Regional College of Education, Bhubaneswar, India*

In the light of several national and international deliberations pointing out the serious concern about fastly deteriorating environmental quality with special reference to the biological wealth and human life in the biosphere of this planet, an attempt has been made in the present paper to bring out the salient features and recommendations of several conferences regarding the need for imparting environmental education (EE) at various levels for the promotion and the development of environmental consciousness. Lacunae in the development of EE are brought to light. Certain ideas on the EE curriculum development meant for teacher training programmes are presented along with strategies to be deployed both in the formal and nonformal educational systems. A model curriculum working paper is also developed and the salient features are presented for the formal education system.

The role of NCERT in the teacher training EE programmes is also discussed and suggestion for the establishment of an EE directorate or department both in Council and its RCE's (which are involved in the quality teacher preparation programmes like M.Sc. Life Science Ed., 4 years B.Sc. Ed. integrated and 1 year B. Ed. programmes) is given. The structure of the non-formal system of EE involving the orientation of development officers is also given. The possible role of universities in imparting the EE among its constituent colleges is also presented.

*Present address—Population education unit, NCERT, New Delhi.

## 64. RELEVANCE OF THE STUDY OF AQUATIC ECOSYSTEM IN THE CONTEXT OF ENVIRONMENTAL SCIENCE EDUCATION.

A.L.N. SARMA, D.G. RAO and P.K. PATTANAIK
*Department of Life Sciences, Regional College of Education, Bhubaneswar*

In an attempt to inculcate environmental consciousness and to develop environmental education materials for school teachers/children with special reference to aquatic ecosystem, case studies of plankton and meiobenthos with reference to the prevailing environmental regime of the brackish water Chilka lagoon were made. To motivate the students towards the environment a brief idea about the significance of current status of the environment is given. The need to preserve and conserve the environment in general and aquatic system in particular is emphasized.

To enable the teacher or student to probe into the environment the necessary methodology for sampling and investigating easily accessible littoral biotopes, are given. Care is taken to suggest low cost materials to undertake the inquiry. A brackish water system is selected purposefully to bring out the striking influence of the salinity, an important ambient parameter of the medium, on the quality and quantity of the life parading through seasons. The significance of such studies in the context of food and feeding habits of economically important fisheries is also highlighted.

## 65. SCHEMATIC REPRESENTATION OF ENVIRONMENTAL EDUCATION IN HILLS WITH SPECIAL REFERENCE TO 'GARHWAL HIMALAYA'

B.P. NAUTIYAL
*Dept. of Forestry, P.B. 14, G.V. Srinagar (U.P.), 246174*

To forbid the deshaping of original environment on one hand and to protect and conserve the existing potential of

natural resources on the other hand require appropriate knowledge of different components of environment, which could be possible by formulating a sustainable and productive educational pattern at different society levels, specially in Himalayan hills which are characterized by their fragile ecosystem and are considered as the resource reservoir for human welfare. The millions of years back demand for raw materials for survival and existence of living beings tend to compel them either for evolution or for extinction. The so called dynamism in socio-cultural and economic pattern of an area may be termed as the process of threatening, endangernment and extinction due to gradual escapement of their livelyhood environment. Thus, the changes in structural components certainly resulted into functional dynamism in relation to human aspects as a whole.

The present paper deals with (i) Modelling of degrading environment and (ii) Formulation of an environmental education pattern, suitable for implementation as the different age groups and society levels are tried to link with (i) Fundamentals of Environmental education, (ii) Action Programme and (iii) Operational researches. The co-ordination of education, technology and researches with each other is suggested as an immediate need which is possible through mass communication programme. The compulsion of manual work in such pattern would have the paramount importance and is suggested to implement it for future oriented multidimensional improvement of natural environment by establishing the Forest Banks in hills at official, socioscientific and socio-economic level. The models of environmental degradation, pathway of environmental education and forest banks are presented in this communication.

# 66. CURRICULUM MATERIAL FOR A COURSE IN ENVIRONMENTAL CHEMISTRY AT POST—GRADUATE LEVEL

P. RAMACHANDRA NAIDU

*Department of Environmental Chemistry, Sri Venkateswara University, Tirupati 517502, India*

Population explosion, industrialisation and urbanisation have contributed to deterioration in the quality of man's environment. Education to provide knowledge, understanding and to develop responsible attitude about the nutural and man made chemical processes occurring in environment is, therefore, urgently required. Thus there is a demand for Environmental Education at all levels—school, college and university. A review of chemistry curricula taught at school, college and university levels in developing countries shows that the curricula do not include principles of environmental chemistry. This may be ascribed to non-availability of curriculum materials and trained personnel who could be instructors in environmental chemistry at different levels. Hence there is an urgent need to prepare curriculum materials and also to train personnel, who could teach environmental chemistry. This paper deals with curriculum material for a post graduate course in Environmental Chemistry, It is not easy to define the scope of environmental chemistry because of its interdisciplinary nature. However, courses which cover environment, energy, pollution and analytical methods in environmental chemistry may be included in the curriculum. This programme is to be offered as an elective over a period of one year or two semesters at post graduate level. The minimum prerequisite is one year or two semesters of general chemistry, after earning the three year B.Sc., degree. courses in inorganic, physical, organic and analytical chemistry are to be offered under general chemistry. Further more, the students have to complete a practical course in analysis which includes detection and determination of inorganic and organic materials at trace levels,

## 67. ENVIRONMENTAL EDUCATION AND OVERVIEW

R. ARORA and G.N. PANDEY
*Department of Chemical Engineering,*
*H.B. Technological Institute, Kanpur*

The growing concern for effective control on ever increasing environmental degradation is obvious. The importance of environmental education in development of general awareness to have an integrated approach for a balanced view of population, industrialization, resource development and utilizatian, food production with increasing inputs of fertilizers, pesticides and machines and pollution has been briefly discussed in the paper. The salient features of environmental education programme needed at different levels have been briefly described with a detailed programme for post-graduation in Environmental Science and Engineering.

## 68. TEACHING OF ENVIRONMENTAL GEOSCIENCE IN INDIAN UNIVERSITIES

K.P. SINGH
*Centre of Advanced Study in Geology, Punjab University,*
*Chandigarh-160014, India*

Man and his interaction with the natural environment has created numerous changes to parts of lithosphere, hydrospere, biosphere and atmosphere. There is a general awareness in this country about degradation of the human environment and the related hazards. Though the significance of Geology in almost all aspects of man's use of environment in which he lives and works is belatedly gaining recognition in many parts of the world, yet at the university level there is no formal course of study covering the interaction between natural systems and man. It is envisaged that there should be a radical change in the geology curriculum at [all levels of

instruction with reference to teaching of environmental Geoscience in order to provide a better understanding and application of man's relationship with his physical and biological environment. A multi-disciplinary approach would make teaching more realistic and practical. A model curriculum covering one academic year or two semester course in Environment Geoscience at Master's level is discussed in the paper.

## 69. ENVIRONMENTAL EDUCATION PROGRAMME FOR SCHOOLS

R.P. SHETYE

*Socleen, Garden Resort, 606, Sion-Trombay Road, Bombay-71*

The main components of nature are air, water, soil and biota. All the living organisms in the biosphere derive their sustenance from the abiotic components of nature. On death of organisms, the elements constituting the organisms, again return to the aboitic component through decay. This is termed as the natural cycle.

The quality of environment, on which present forms of life are dependent, has been recognised during the past few decades as an important variable. Deforestation, soil erosion, industrialization and increased population are the main factors responsible to the environmental change.

While there may be levels of pollution that will be acceptable to the public as a trade off for other benefits, some public groups have shown that they are unwilling to compromise human health for developments. By now most of the public groups are well aware of the acute toxicological effects of environmental pollution evidenced during periods of adverse conditions around the world.

Identification and description of these problems, is one

of the major approaches in science, in the present times. Broadly, this approach falls under the discipline, *Environmental Sciences*. A good understanding of this discipline would lead to planning suitable measures for restoring balance of nature. Such efforts would go a long way in conservation of nature, which is an urgent need of the day.

Keeping this in mind Society for Clean Environment, Bombay, has concentrated on imparting education on various aspects of the environment at school and college levels. Students from the ten different school are selected for the project. The programme includes lectures with release of cyclostyled material, and essay writing competitions, poster painting and quiz. Excursions to polluted and unpolluted regions are also arranged for the students. This project is under operation from Oct. 1981, and will get over by end of January 1982. Depending on the success of this project, the same programme will be conducted as the regular feature of the society in future.

## 70. IMPACT OF ENVIRONMENTAL EDUCATICN ON CONTROL OF COMMUNICABLE DISEASES IN A RURAL SETTING.

M.L. ATRI., S.K. SHARMA and H. GERA
*Chandigarh*

Any factor intrinsic or extrinsic which affects the health of an individual, directly or indirectiy constitutes environment These factors may be social, physical and biological.

The majority of India's population (80%) lives in rural areas where agriculture is the main occupation. The ruralites have not received the benefits of planning, improved health services, better communication and easy dissemination of knowledge on environmental health. They are still relying on primitive methods of sanitation and where water pollution with excreta poses a major health hazard. By environmental

health education the people were motivated to fill the depressions and proper drainage etc. the spectrum of infection can be considerably reduced.

In a study conducted in the rural areas of Haryana in Raipur Rani block of Ambala district by educating and involving the local people a common aggreement was reached for the provion of latrines (2) no body will walk barefootted and (3) no body will defecate in the open.

As a result of this planned intervention the incidence of parasitic diseases has considerably decreased.

The authors recommend the inclusion of environmental education in the adult education, school children educational curriculum.

## 71. INDUSTRIAL POLLUTION IN MADHYA PRADESH: A BRIEF REVIEW

A. K. BHATTACHARYA and R.R. DAS
*School of Studies in Botany, Jiwaji University, Gwalior*

Man's activities with urbanisation and industrialisation mainly contribute to the environmental problems.The growining industries, with few exceptions are the major offenders of environment in creating the pollution hazards. Madhya Pradesh, which is the biggest state of India, is now emerging as a powerful industrial state. At the same time because of the lack of awareness of environmental problems this growth in industrialisation is going to pose a great problem. The total number of industries in Madhya Pradesh is about 208, out of which many are obnoxious and are creating menacing problems. The major industries are textiles (Gwalior, Indore, Mandsaur, Ratlam, Dewas, Bhopal, Khandwa), silk fabrics (Indore, Gwalior, Nagda), sugar (Jawra, Dabra, Sehore, Kailaras), cement (Camoor, Banmore, Satna), coal (Bilaspur, Chhindwara, Sidhi, Shehdol, Sarguja), steel (Bhilai, Raipur),

flour (Raipur, Bhopal, Gwalior), Paper (Nepanagar, Amlai), caustic soda (Amlai, Nepanagar, Nagda), sulphuric acid Nagda, Bhilai). Detailed informations regarding the pollution effects caused by these industries are not available. However, some work has been done on the effects of and damage caused due to the effluents from various sugar factories, rayon factories, textiles factories, steel foundries, paper factories of Madhya Pradesh. Nagda, Amlai, Bhilai, Nepanagar, Gwalior, Indore, Bhopal, Shehdol are some of the important towns from the view point of environmental degradation. The air pollution caused by the $CS_2$ gas from caustic soda plants (at Nagda, Amlai, and Nepanagar) and also by cement dust from cement factories (at Gwalior, Jabalpur, Camoor, Satna, and Madhar) must get immediate attention. Similarly the water polluting industries situated near the rivers (Nagda, Amlai, Katni, Satna, Bhilai, Nepanagar) should also be paid proper attention. Unfortunately the industrialists, being interested in profit alone, disregard the environment. Such an attitude is detrimental not only to the growth of the present but also to the welfare of the future generation in view of the long term effects of environmental pollutants.

## 72. CHANGING ECOLOGY AND CONSERVATION OF DAL LAKE IN RELATION TO INCREASING IMPACT OF HUMAN ACTIVITIES

V. KAUL

*Department of Botany, Kashmir University, Srinagar-190006*

The Dal lake has not only been shrinking in its surface area during the past few centuries, and more especially the past few decades, but its waters are also becoming bad, posing health hazards to many people-chiefly as a result of i) growing population along the catchment and in the lake itself resulting in the growing pressure on the lake system due to accelerated land-use along the catchment and higher disposal of domestic refuse, garbage and sewage into the

water, ii) higher silt-cum-nutrient load brought into the lake system due to denudation of the mountainous catchment, wash-off from agricultural fields, plant debris and allochthonous material resulting in the filling up of the lakeside a d eutrophication, iii) the greater recreational demands, particularly the use of an ever increasing number of house-boats, doongaboats and shikaras for luxury and permanent dwelling and navigational purposes and the power boats for aquatic sport resulting in oil spill and wave-dash, and moreso iv) the illegal encroachment and reclamation of huge tracts in the form of floating gardens or islands for vegetable cultivation, or shop and house construction purposes, which are vitally eating into its very life and existence.

Concerned with the fast dwindling of the lake the State Government, under the expert technical advice, is adopting certain remedial measures to salvage the sick lake system, which indeed is a great socio-economic asset besides being the greatest tourist attraction and a potential revenue earner-so that it is not only legend to the posterity. These aspects alongwith the need of a monitoring component pertaining to the sampling of the current state, detecting the likely changes and checking on the efficacy of the new management stratagies in regard to pollution, renewable resources, environmental processes, environmental quality and organizational and institutional arrangement that facilitate or obstruct the implementation of effective monitoring systems, are briefly discussed in the text of the paper.

## 73. ENVIRONMENTAL POLLUTION & HUMAN HEALTH (A CURRICULUM FOR SCHOOL AND COLLEGE STUDENTS)

D. SATYNARAYANA,
*Dept. of Chemistry, Khallikote College, Berhampur (Ganjam), Orissa*

SUNDARA NARAYANA PATRO,
*Dept. of Botany, Govt. College, Phulbani, (Orissa)*

Man's taste for sophisticated life brought in modern science and technology in an accelerated pace. This has

subscribed to modification of his own environment from natural to artificial in countless ways. For the survival of his own race man has to learn how to live with the natural as well as the modified environments. Therefore for the welfare of the man and economic development throughout the world the protection and improvement of the environment is essential for him.

Unlike the ancient man now the modern man dwindles in an ocean of poisons that has accumulated into the environment from time to time. A modern student is not very much aware of the poisons present in the food he eats, water he drinks, air he breathes and the surroundings he dwells in. Inclusion of "Environmental pollution and Human Health" as a curriculum in schools and colleges will make him aware of his own environment and he will learn how to live with. Environmental education will also help people change their food habits, live in clean habits etc. and develop consciousness towards improved technologies to reduce the use of hazardous chemicals.

The pollutants may be biodegradable and nonbiodegradable. The non-biodegradable chemicals are persistent and they enter different types of species, finally getting into the man through food chain. Directly or indirectly through the enviroment numerous chemicals, therefore, enter man's body. These chemicals in enough quantities may lead him to death or to severe illness as an immediate effect. Sometimes the effects are not visible immediately but manifested gradually over a long period say 20 or 30 years leading to genetic mutations, cancerous diseases and still births when in very low concentrations.

The source of pollution may be nuclear wastes, industrial effluents, laboratory chemicals, food articles, occupational pollutants, agricultural wastes, sewage disposal, chemical fertilisers, pesticides, herbicides, autoexhausts of poisonous gases, industrial smokes, industrial leakages etc.

It is never possible to do away with the pollutants as we

depend more and more on modern living yet the flow of harmful chemicals into the environment could be controlled. This needs stress on improved technology, stringent anti-pollution laws, change of peoples habit and cooperation of people in general. The most important of all is the enforcement of governmental legislation rationally. Experience in the past makes it clear that when some countries ban the use of certain hazardous chemicals other countries either manufacture the same or purchase from the manufacturers of countries where the use of such chemicals is banned. Because the problems of developed countries are sometimes different from the developing countries. But the environment has to be understood in its totality. If one country bans and the other countries do not ban the use of certain cnemicals the pollution cannot be controlled. So rational environmental education on a global scale is imperative for a healthier tomorrow.

## 74. IMPACT OF HUMAN POPULATION ON THE FORESTS OF GARHWAL DISTRICT OF CENTRAL HIMALAYA

B.N. DWIVEDI

*Silviculturist, Hill Region, Naini Tal*

A.N. PANDEY

*Department of Botany, Kumaun University, Naini Tal*

R.P. SINGH

*Department of Forestry, Kumaun University, Naini Tal*

This paper deals with an assessment of the impact of human population on the forests of Garhwal district situated in the Central Himalaya. It is estimated that the expanding agriculture brought about 5.2% depletion in the total forest area in the decade 1971-81 and by the end of this country the forest area will deplete by 17.7%; Fuel and timber utilization is rather a serious problem. The existing forest stock, is not more than the estimated utilization of fuel and timber by the year 1995. People in Garhwal are under

the crisis for fuel energy and the problem would be acute in the later part of the decade 1991-2001. Grazing pressure was found 7.2 times higher than the carrying capacity resulting natural regeneration of the forest almost in a failure. It is suggested that the plantation of fuel tree species, rotational lopping, introduction of high yielding fodder plant should be undertaken on the priority basis to save the region from the misery of life and ecological imbalance.

## 75. POLLUTION OF GROUNDWATERS IN THE HYDERABAD METROPOLITAN AREA

P.V.L.N. RAO
*N.R.D.C.S. Limited, Hyderabad*

The non technical presentation of the subject of this paper must be regarded more as a general appreciation of a problem of immediate concern. It is a loud thinking on the efforts that could be made to find a solution. Attention, therefore, is drawn to the manifold increase in the utilization of ground water resources in the Hyderabad Metropolitan Area, for meeting the demands of agriculture, industry, and urban as well as rural populations. The crucial role played by ground water, during the last decade, in bridging the yawning gaps in the governmental schemes for water supplies and the needs of the urban areas is analysed.

The importance of ground water in supplementing the public water supply schemes for the coming decades is stressed, drawing particular attention to the pollution that had already set in, and the urgency to monitor carefully its origin, spread and impact on the ground water regimen of the area. The differing conceptions of pollution of surface and ground waters are considered with a view to highlight the problems that are peculiar to the latter.

An attempt is made: (i) to define the problem of ground water pollution by identifying its constituents and

their interplay, and (ii) to determine the scope for interdisciplinary action to find a solution to it. An outline of the proposed systems of investigation is presented here to subject them for a critical analysis and review, enabling the author to proceed with the necessary field and laboratory studies that would ultimately contribute to a better understanding of the problem in the long and short runs.

## 76. GHANA BIRD SANCTUARY, BHARATPUR—A CASE STUDY IN NEED OF ENVIRONMENTAL EDUCATION FOR DECISION MAKERS

**BRIJ GOPAL**

*Botany Dept., Univ. of Rajasthan, Jaipur-4*

Keoladeo Ghana Bird Sanctuary at Bharatpur near Agra, is one of the finest wetland areas in the world. Spread over an area of 29 sq. km.. it is a refuge for several hundred species of native and migratory birds. These include the endangered Siberian Cranes. There have been several studies on the bird migration but a holistic analysis of this important ecosystem has never been attempted. The sanctuary faces the problem of large water level fluctuations, severe floods and drought, and aquatic weeds. During periods of drought, cattle grazing is allowed within the sanctuary, usually under political pressures. Among other important ecological problems are: providing trees for birds, control of population and undesirable biota, and providing enough food resources for birds. Our present scientific information is too meager to suggest proper ecologically sound management strategies for the area. The long term impact of cattle grazing is not understood but conflicting views are expressed every year on the subject by politicians, public and managers of the area. It is emphasised that an intensive investigation is required to provide basis for management and education of the people about the value of the sanctuary and impacts of haman activies therein.

## 77. EFFECT ON CLIPPING MANAGEMENT AND NITROGEN TREATMENT ON THE DRY MATTER YIELD AND QUALITY IN A RANGE GRASS *DICHANTHIUM ANNULATUM* (Staf.) FROM THE UPPER GENGETIC PLAINS OF INDIA

**H.R. SANT and R.S.P. SINGH**

*Laboratory of Terrestrial Ecology, Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi-221005*

The present study deals with the effect of clipping management and nitrogen treatment on the dry matter yield and forage quality of *Dichanthium annulatum* (Staf.) from the grasslands of Varanasi. Different nitrogen doses and different heights and interval of clipping were given to *Dichanthium annulatum* which is a perennial grass with the wide ecological amplitude. It is one of the best fodder grass for all classes of live-stock and is supposed to be the best hay crop which is superior in yield, palatability and nutritive value.

The maximum dry matter yield was obtained to be at 10 cm height and 30 days interval of cutting with addition of 60 Kg. N/ha respectively. As regards the quality of forage, crude protein and phosphorus wax higher in frequently clipped plants i.e. 15 and 30 days interval of clipping whereas the structural constituents like lignin, crude fibre and cellulose percentage was recorded to be higher in unclipped plants or those which were clipped at interval of 45 days. Nitrogen fertilizer which significantly affects the forage quality, the percentage of crude protein and soluble carbohydrate was found to be increased with increasing level of nitrogen.

## 78. ON THE REVERSAL IN THE SEQUENCE OF STATOBLAST PRODUCTION IN *PLUMATELLA CASMIANA*, OKA (ECTOPROCTA : PHYLACTOLAEMATA: PLUMATELLIDE) DUE TO ENVIRONMENTAL IMPACT

**K.S. RAO and VINODINI AGGARWAL**
*Environmental Biology Unit, School of Studies in Zoology, Vikram University, Ujjain M.P. India*

Environmental impact on freshwater organisms is acute. A case study of *Plumatella casmiana* which is a common polymorphic freshwater ectoproct was dealt in the present report. Colonies of this species studied in Saw-hill ponds of Boulder, Colorado, North America presented a sequence of its statoblasts in the order of intermediate statoblasts in autumn, pyknoblasts in winter and leptoblasts in spring. The binding mechanism of each type of the statoblast is adapted to the severity of the environmental condition. The strongest binding mechanism of the statoblasts was recorded in the severest winter seasons in N. America. The present study recorded the same species from Indian waters for the first time, but found a reversal in the sequence of statoblasts production. Pyknoblasts having strongest binding were recorded in severe summer months, leptoblasts in the favourable winter and intermediate statoblasts in the spring seasons. Thus a reversal of environments in N. America and India, is reflected in a reversal in the sequence of the type of dormant body production in *Plumatella casmiana*.

## 79. EFFLUX OF POTASSIUM FROM CYANOBACTERIAL CELLS EXPOSED TO CADMIUM AND BISULPHITE

**S.P. SINGH, A.K. PANDEY and R.P. SINGH**
*Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi-221005*

Cadmium ions induced loss in cell $K^+$ of *Nostoc calcicola* in a concentration-dependent manner eith only 20 percent

of the initial cell K+ being left following 48 h of incubation in presence of 3 ppm Cd in a nutrient medium devoid of calcium ions. Similar pattern of Cell K+ loss was observed in case of bisulphite-treated cells. Calcium ions showed antagonistic interaction with the above two pollutants. The observations have been discussed in the light of the possible mechanisms of the membrane damage and the interactions between the pollutants and calcium ions.

## 80. EFFECT OF ENVIRONMENTAL POLLUTION ON THE FUNCTIONING OF CHLOROPHYLL OF CERTAIN PLANTS

M.L. DALAL, V.B. CHOUDHARY and S.P. DAVE
*S.N. Govt. P.G. College, Khandwa, (M.P.) 450001*

The National Newsprint and Paper Mills, Ltd. Nepanagar, situated in the East Nimar, Khandwa, district releases polluted water through different drainage lines. The water is polluted mainly due to causti-cchlorine plant, due to mercury electrodes for electrolysis, and waste of wood pulp. The chlorophyll of plants grown and found in the beds of the polluted water and those grown and found in normal environment have been studied by optical absorption spectrosepy at room temperature under various conditions.

## 81. ROLE OF EDUCATION IN GENERATING ACCEPTANCE ON THE WATER FRONT

GYAN SAGAR
*Executive Engineer U.P. Jal Nigam Lucknow*

Generally low priority is accorded to educational approaches in developmental projects. It is hoped that with

the input of the technology alone, the beneficieries would automatically participate by acquiring the necessary knowledge. But it is seldom true. With the rural water supply schemes being executed with heavy Government grants, the risk involved with the people is reduced to nothing. Therefore, suitably designing an 'education' strategy and implementing it right from its conception would go a long way in speedy acceptance of all our innovations.

In this paper a suitable educational strategy for water supply projects has been discussed.

## 82. REVIEW OF THE MAJOR ENVIRONMENTAL CASES OCCURRED IN TAIWAN

EDDIE YUE-HWA YU
*Taiwan*

A chronicle review of the major environmental cases occurred in Taiwan since 1970 has been made. The following are the year and a brief description of the cases.

| *Year* | *Case* |
|---|---|
| from 1970 to present | Pollution of water resources to industrial and domestic discharges |
| 1972 | Case of intoxication by tri-and tetrachlorothylene in an electronic factory |
| 1974 | The case of the drug, "Thalidomide" |
| 1977 | Marine pollution by tanker wrecking |
| 1977 | Air pollution by acrylate monomer |
| 1977 | Air pollution by formaldehyde, $SO_2$, NOx and $O_3$ |
| 1978 | Release of hydrogen cyanide in an industrial district |
| 1978 | Leakage of chlorine in an industrial district. |

## 83. PARTHENIUM, ITS HAZARDS AND ERADICATION

ASHA GUPTA
*Nehru Memorial Model Junior College of Science, Nagpur*

*Parthenium hysterphorus* Linn is an obnoxious weed of world wide distribution. It is presumed to have been introduced into India unnoticed as a contaminant with PL-480 food grains. It has naturalised in many parts of India and has adapted to Indian soil and climate. Considerable evidences regarding its being a health hazard are available in our country. Besides, the plant releases in the soil toxic substances and produces ill effects over other plants in the vicinity. It grows fast, sucks nutrients from the soil and starves the neighbouring plants. So to have control over such obnoxious weed, it is desirable to bring some change in plant's environment itself. Modification of this environment involves various control measures.

The paper discusses various methods of eradication. According to the author, the best time for control is the pre-monsoon period in which the food reserves of this plant are low. If proper chemical treatment is administered at this time, control can be brought out. For complete eradication a co-ordinated effort is requested which can be done by selecting this particular period of time during which every state carries out its plan of action. As *Parthenium* is a national problem; government, educational institutions, municipality and public organisations should come forward to create awareness among people and to arouse ecological consiousness through various media, Let us educate the masses and have our environment free from the dangers of *Parthenium.*

## 84. SLASH AND BURN AGRICULTURE SYSTEM—A MODEL FOR UNDERSTANDING BASIC ECOLOGIC PRINCIPLES.

P.S. RAMAKRISHNAN

*Department of Botany, School of Life Sciences, North-Eastern Hill University, Shillong-793014*

One of the predominant land use practise in the north-east hill areas of India involves shifting agriculture popularly known as 'Jhum' which involves slash and burn of forest or any natural re-growth of vegetation followed by cropping for a year or two before the land is abandoned for natural re-generation of vegetation. The jhum cycle (which is the time interval before the same site is cropped again) has been reduced in recent times from a long cycle of 20-30 years to as short as 4-5 years.

The present paper deals firstly with the agro-ecosystem function, with particular reference to cropping and yield patterns under different jhum cycles, energy flow through the agro-ecosystem and the weed problem associated with shortening of the jhum cycle. Secondly, it deals with the economic and energetic interrelationships and flow patterns through a Khasi Village under shifting agriculture indicating the ecological self-sufficiency of the village ecosystem and the ecological limitations imposed by shortening of the jhum cycle. Thirdly, the study relates to the hydrology, sediment and nutrient losses from agro-ecosystem and the fallows developing subsequent to slash and burn agriculture upto a period of 20 years. Finally, the nutrient recovery pattern in the soil, biomass, productivity and nutrient cycling patterns upto 20 years of fallow development have been considered.

Apart from its applied implications, such as interdisciplinary study of a given system as 'Jhum' has been used to identify and illustrate different important principles and concepts in ecology.

## 85. ENVIRONMENTAL POLLUTION CONTROL AND WHO PAYS FOR IT

ANJALI KUMAR AGARWAL
*Directorate of Geology & Mining, U.P. Lucknow*

Environmental pollution has been a product of human life. Now it is a matter of deep concern all over, the world. It is increasingly becoming more difficult to maintain the quality of the environment, specially in view of the fact that the demand for raw materials, energy and production of goods is growing at over increasing rate, at a time when the population growth is termed an "explosion". In fact, it is a matter of 'trade off' in developing countries like India, where, to find jobs and feed the millions we have got to increasingly extract the minerals and fuels from the bowels of earth and use them for production of goods at a cheaper rate. Cheaper, because we cannot afford costly items and pollution control methods are expensive, pollution control methods are bound to reflect on the cost of goods. On the other hand pollution control is a must for our health and existence.

Our concern for maintaining the quality of environments is not unfounded. The present article attempts to discuss some vital questions (1) What constitutes environment and what are the impurities? (2) What contributes to its pollution? (3) How pollution affects us? (4) How to control further degeneration of the environment? (5) Economic considerations, its cost to the society and who pays for it? (6) Analysis based on economic theories for implementation of pollution control through—(a) legislation; (b) tax; or (c) incentives and (7) What may be the agency—the pollutor or a governmental centralised agency?

The above discussions are with special emphasis on mining and mineral industries. It may, however. be clarified here that though the mining of minerals and fuels are most vital for increasing per capita level of living and support for the growing population. The industrial society and its way of life, insatiable demands for energy, and time saving devices for more leisure and diversification has introduced many new

forms of pollution by indiscrimate use of resources which is mainly responsible for accelerating the deterioration of environmental quality. Therefore, the idea of voluntary or some induced restraint on consumption and recycling won't be out of context here. The exploitation of physical resources without proper planning and control must be checked to avoid disaster by good management of natural resources for their best and minimal use.

The position is still not so bleak and hopeless. A rational approach for containing the population and use of resources can still check and decelerate the deterioration to a level where human adaptability can keep pace with the changes. After all today's man is an adaption of unicelluar life passing through various stages of life through the ages.

## 86. THE SIMILIPAL IN PERIL

SUNDARA NARAYANA PATRO
*Dept. of Botany, Govt. College, Phulbani, (Orissa).*

India is fast heading towards an ecological disaster. Out of 750000 Sq. Kms more than 50,000 Sq. Kms of forest land in the country have been lost over the past two decades. There was little realisation of the fact that forests besides being important to habitat wild life, preserve genetic species, maintain climate, conserve soil, regulate moisture, stream flow and water supply, are a vital ecological necessity for the protection and improvement of the environment without which serious results and disastrous consequences could follow. Foreseeing the dangers of ecological consequences of deforestation and disappearance of genetic species the UNESCO's MAB committee plans activities aimed at promoting a new conception of the preservation of the natural heritage that is based on the conservation of the ecosystem in its integrity as an essential measure for conserving genetic material of wild plants and animals. The committee's Task Force has laid down criteria to identify some areas as "Bio-

sphere Reserve Areas". The Similipal in Orissa is one of the areas fulfilling the criteria deserving to be qualified as a "Biosphere Reserve Area". The forest has valuable timber trees like Sal, Champa, Asana; beautiful orchids; clubmosses; wild animals like elephants, Royal Bengal tiger, gaur Chousingha and birds like Hillmyna etc. Some of the species are listed under "endangered", "vulnerable" and "rare".

Tresspassers encroached and cleared some patches, even in the core area, of the forest with a view to settling up there and raise agricultural crops. The local inhabitants used to destroy the forest and wild animals. These activities could be arrested to a great extent by governmental vigillance. Now the Orissa Government has established the Similipal Forest Development Corporation with the financial assistance of the World Bank. No doubt this will be a better organisation than the private contractor system which was slaughtering the trees indiscriminately. The corporation's programmes are self contradictory and do not confirm to the criteria set by MAB committee. The Project report indicates that more stress will be given to commercial exploitation than to conservation. Roads have been constructed, tourists bungalows are being constructed, mixed forests are being replaced by artificial forests, a large number of labourers are being employed to collect forest products and timber. Biggest factor like disturbance to wild life due to movement of vehicles and men, loss of genetic species will contribute to change in microclimate and gradually modify the forest. In the long run this is bound to disturb the ecological balance of the area leading to permanent loss of wild life. Before it is too late a total rest must be given to the forest for at least 10 years; for natural growth to its prehistoric stage. Instead of only 303 Sq. Km. now covered as protected forest as the "Tiger Reserve Area" the whole of Similipal covering an area of 2700 Sq. Kms must be declared as Protected forest and a protective ring be thrown around the area & the forest be declared as a "BIOSPHERE RESERVE" area to save Similipal the uncut gem, from the peril.

## 87. CROP RESPONSE TO FLUORIDE POLLUTION

S. S. PUROHIT

*Department of Botany, Government Post Graduate College, Nagaur 341001 (Raj.) India*

Fluoride pollution is a global problem. Recognization of fluoride hazards to crop plants has been documented since late 19th century. Under natural conditions it is available as a component of soil, rocks and minerals. In soil, fluoride occurs at a mean level of about 500 mg/1. In several districts of Rajasthan such as Nagaur, Jodhpur, Bikaner, Pali, Sirohi etc., at several places, soil pockets possess supra-optimal fluoride concentrations. Water soluble fraction of fluoride is also alarming. Water samples of Rajasthan State reveal that out of 26788 villages, 5689 contain 1.1 to 2.0 mg/1;2158 contain 2.1 to 3.0 mg/l; 1308 contain 3.0 to 5.0 mg/l and 515 contain 5.1 to 48 mg/l fluoride. Apart from soil and water gaseous fluoride also pollute the environment. The major toxic effects of fluoride on crop plants are mutagenicity, enhanced RNAs contents/activity, accumulation of ATP, reduction in seed water content, per cent germination and seedling growth, yellowing of leaves etc. It also reduces /increases biomolecules levels such as total sugars, total reducing sugars, total phenols, tryptophan level, amino acids and enzyme activity of plant cells. It also reduces georeactive activity of root segments. To control the delicate balance between world population, human health and food supply it is necessary to minimize fluoride pollution in crop growing areas. The problem should be worked out by agro-climatologists, physiologists, agronomists and breaders collectively to enable them to solve the burning problem of world crop production and pollution.

## 88. CLUSTER OF DEMONSTRATION LOW COST HOUSES PUT UP BY REGIONAL RURAL HOUSING WINGS OF N.B.O.

H.B. MATHUR
*National Building Organisation, New Delhi-110011*

The NBO has evolved a typical design of house for the rural poor based on the 'Minimum Needs Concept' for a plot size of 83 sq. meters (100 sq. yards) being allotted to the landless rural families. The house has a plinth area of 20 sq. meters having one room with a covered cooking place and a platform. A sanitary latrine and a washing platform are also provided. The house design allows for construction of another room at a later stage. Based on this design concept, the Regional Rural Housing Wings of N.B.O. have so far put up 26 clusters of 10 to 20 demonstration low cost houses alongwith environmental improvement in different regions in the country. It is continuing plan scheme of NBO the objectives of which are to demonstrate how rural houses can be constructed at low cost making improved use of local materials to the extent possible and by employing self-help labour.

Local requirements as regards liveability and climatic conditions are taken into consideration in evolving designs of houses that are functional and durable.

Items of environmental improvements such as provision of sanitary latrines, batching platforms, drainage, paved streets, supply of potable water, provision of streets and open spaces are essential components of the cluster demonstration housing project. The cluster demonstration housing project is implemented in collaboration with the state government concerned. The houses are allotted to beneficiaries such as landless agricultural families, harijans and tribals identified by the state government from whom feed back of experiences are obtained. The houses are given away to the beneficiaries by recovering upto 2/3rd of the cost of the house through the state governments.

A list of cluster demonstration low cost rural houses put up by Regional Rural Housing Wings of NBO indicating cost per dwelling unit in different regions in the country is placed.

## 89. MAPS OF VEGETATION AND ENVIRONMENTAL CONDITIONS

V.M. MEHER-HOMJI
*Institute Francais, Pondicherry*

Principles and applications of the maps of vegetation and environmental conditions prepared at the French Institute, Pondicherry under a scheme of I.C.A.R. will be discussed. Differences between climatic and bio-climatic approaches will be pointed out. The role of forests in the precipitation cycle will be emphasised.

## 90. CADMIUM IN AHMEDABAD

T.S. PATEL, C.B. PANDYA, D.J. PARIKH, and S.K. CHATTERJEE,
*National Institute of Occupational Health, Meghani Nagar, Ahmedabad-380016*
N.L. RAMNATHAN
*Department of Environment, Technology Bhavan, New Mehrauli Road, New Delhi-110029*

Cadmium concentrations in the local environmental samples like air, water, food and cigarettes/beedis are determined for Ahmedabad city which is one of the leading industrial centres in India. Based on these observations the risk of exposure to cadmium through major environmental sources is estimated for the residents of the city. Results of the study indicate that food is the major source of cadmium intake.

Total intake through major environmental sources is found within the recommended daily intake for the healthy individuals.

## 91. A STUDY OF REMOTELY SENSED DATA IN REATION TO RIVER POLLUTION

A.N. PATEL and H.S. MEHTA
*Department of Civil Engg. G.S. Institute of Technology & Science, Indore (M.P.) 452003 India*

The revolution in Science and Technology of this century has created new and puzzling situations in the management of environment. The quality of our environment would be a reflection of man's ability to plan and manage it. We are in the 'P game', the exponential rises of people, production, power, and pollution. Industrialization coupled with increasing population and urbanization give rise to increasing pollution, thereby causing extensive environmental degradation. The problem is more acute in cities than in rural areas.

This paper estimates the hazards of water pollution of the river Khan which flows in the heart of metropolitan city Indore, Madhya Pradesh, India. The problem is exacerbated by the fact that, the river Khan which receives effluents from various industries has seasonal flows for three to four months only. During the rest of eight to nine dry months the dilution factor is practically nil. The quality of the river water has been studied by conventional methods as well as by remotely sensed data obtained by using remote sensing techniques. An attempt has been made to correlate remotely sensed data with degree of pollution at various locations in the river Khan.

## 92. EFFECT OF SUGAR FACTORY EFFLUENTS ON SOIL AND CROP PLANTS—A CASE STUDY

**DR. MOHAMMAD AJMAL and AHSAN ULLAH KHAN**
*Environmental Research Laboratory, Chemistry Section,*
*Z.H. College of Engineering and Technology,*
*AMU, Aligarh*

Industrial wastes treatment and disposal is a world wide problem. They cause soil pollution if discharged on land and water pollution when discharged in streams and lakes etc. Sometimes very fertile soils become barren due to these discharges. Such wastes are also used for irrigation purposes if do not contain any highly toxic material or heavy metals. Sugar factory wastes contain some important plant nutrients like N, P, K, Ca & S etc. of which N, P, K, are the macronutrients of the plants. These wastes if utilized for irrigation may give some useful results which will solve the problem of disposal and treatment both.

Physico-chemical parameters of the sugar factory wastes like, turbidity, hardness, Nitrogen-amonia, DO, BOD, COD etc. were determined. Sugar factories selected were. Kisan Sahkari Chini Mills Ltd., Satha (Aligarh) & Panniji Sugar & General Mills (Bulandshahr). The effects of these wastes were observed on the germination & growth of some crop plants. The crop plants selected were the kidney bean & Millet.

It has been observed that the amount of micronutrients increased in soil without plants irrigated by the waste. But the amounts of nutrients was less in soil in which the crop plants were grown. This happened due to the uptake of the nutrients by the plants from the soil.

The germination of the seeds was delayed in the pots irrigated by the undiluted wastes and also the growth of seedling was inhibited. However, the irigation with diluted wastes helped in the quick germination of seeds and the plant growth was also enhanced.

## 93. DAL LAKE—PAST, PRESENT AND FUTURE

D.P. ZUTSHI
*Centre of Research for Development, University of Kashmir, Srinagar*

Dal lake (lat. 34°5' N- long. 74°5' E, alt. 1584 m is regarded as one of the most beautiful spots in the world and is a great trourist attraction. Over the years rapid increase in land use and agricultural practices in the catchment area have resulted in deterioration of lake's pristine nature. Discharge of effluents without any treatment in the lake from human settlements and houseboats is a common practice which is being followed unabated. Deforestration and excessive grazing in the watershed results in movement of heavy load of silt that settles in the lake basin year after year reducing water depth. It is estimated that out of 2200 ha of open water area of the lake at the beginning of the century has reduced to nearly half as a result of unauthorised occupation. All these changes are reflected in water quality deterioration. High incidence of faecal coliform and excessive weed growth is a serious hazard that faces the aquatic sport in the lake.

The present paper is a case study of the Dal lake based on past researches, present status of the Dal development project and prospects for future restoration of the ecosystem. The results of water quality monitoring undertaken by the Centre of Research are also discussed.

## 94. ENVIRONMENTAL LEAD EXPOSURE AS A HEALTH PROBLEM IN INDIA (AN OVERVIEW)

C.B. PANDYA, T.S. PATEL, D.J. PARIKH, S.K. CHATTERJEE,
*National Institute of Occupational Health, Meghani Nagar, Ahmedabad-380 016-India*
N.L. RAMANATHAN
*Department of Environment, New Delhi-110016 india*

Since long, many studies made in developed countries have contributed to show the levels of lead in various human

environments, body fluids and tissues, which have been discussed with reference to lead poisioning both among general community and industrial population. Indian literature seems to be rare and scattered in this regard. In the present paper, results of the various studies made so far, including the studies carried out by the authors themselves, are focused and discussed.

## 95. EXPLOITATION OF THE RESIDUE OF BIO-GAS PLANTS ECONOMICALLY AND SAFELY

R. KASTURI BAI

*All India Co-ordinated Project on Bio-gas Technology, Sri Parasakthi College for Women, Courtallam-627802 India*

Whether the primary function of anaerobic digestion of organic wastes is reduction of pollution or production of energy, the process will produce a residue which has proved to be of many sided values, in the digested feedstock. Finding a use for digested sludge is an integral part of the production of energy from wastes and it is also relevant to present day thinking on recycling and maximum use of resources.

It can be argued with reason that if the digester feedstock is a waste, that has in any case to be got rid of by dumping, then the cost of dumping the digested waste can be ignored. The fertilizer value of digested excreta is more, so there is double benefit of both gas and fertilizer in this process. If the sludge can replace some thing bought into the farm or factory or if it can be sold off at site, then this provides a monetary return which can decrease the cost of the pollution control. In the case of farms close to other habitation or to water supplies, the digested excreta is over all less polluting and much less liable to cause complaints about odours. In addition, it can be preserved unfed for a period of one

year and more without any appreciable deterioration.

The most efficient method of treating and using the effluent from an anaerobic digester depends on the nature of the feedstocks and local conditions. Since a major advantage of bio-gas plants is the potential fertilizer value of the effluent, an investigation of the handling and use of the effluent should be made under a wide variety of conditions of raw materials, digestion conditions, climate and soil conditions.

Apart from the fertilizer val ıe, the digested sludge has the feed value which resides in the nitrogenous materials and to some extent in the residual fats. Sludge is thus a form of single cell protein (SCP) diluted with fibrous material of little or no feed value. Since the digested effluent is rich in volatile fatty acids, it can be used for the growth of single cell protein production mainly *Candida utilis and Chaetomiun cellulolyticum.*

Vitamin B12 is known to be present in large quantities in the digested sludge and a commercial process for its production from the bio-gas digesters would be a profitable one, at the same time avoiding pollution. Other B-vitamins of bacterial origin are also reported to be present in greater amounts in digested than in raw wastes. To augment the protein content of ruminant feeds and for the full utilization of bacterial protein nitrogen and ammonia nitrogen contained in the sludge, they can be as well added to ruminant feeds. Apart from the direct use of the sludge, the whole or fraction of it could be used as a substrate for growth of algae and other microorganisms which could be in turn used as animal feeds. The digested effluents, thus, has immense potentialities to be used as a fertilizer and feeds instead of getting wasted and polluting the environment.

## 96. NEED OF GLOBAL ENVIRONMENTAL POLICY FOR USING FOSSIL FUELS

R.C. GUPTA

*Dept. of Metallurgical Engineering,*
*Institute of Technology, Banaras Hindu University,*
*Varanasi-221005*

Today the fossil fuels meet more than 95% of the total worlds energy requirements and the past two decades have shown phenomenal growth in the total consumption. This has simultaneously given a rise in carbon dioxide content of the atmosphere causing green house effect which can dlea to many disasters in coming decades. In order to decrease the fossil fuel consumption other energy sources have to be explored which do not cause environmental problem. The paper gives account of these problems and points out the major users in world who can regulate fossil fuel consumption more effectively. The paper draws attention to the need of global policy for judicious use of fossil fuels by developed and developing countries. The paper also appeals the world organisations concerned with environmental problem as to identify the areas in the world which can have massive energy plantation programme as an alternative source of energy and means to remove carbon dioxide from the atmosphere. A programme can be made to provide infrastructure to these areas to develop these new sources of energy with the help of international bodies.

## 97. A REPORT OF THE ECOLOGICAL IMPACT OF UJJAIN URBAN AREA ON ITS POPULATION AND AQUATIC BODIES.

K.S. RAO and SURESH JAIN

*Environmental Biology Unit, School of Studies in Zoology,*
*Vikram University, Ujjain, MP. India*

Ecological impact studies were conducted on aquatic bodies around the pilgrim city of Ujjain to study the impaet

of fast urbanisation of the city on its ancient aquatic bodies. About 60 medium and small factories of this city release their effluents into river Kshipra, out of which 8 have been found to be extremely damaging to the environment. The pollution status of Ksheersagar pond has been established, where the aquatic life is restricted to a surfial level of one meter. The Mahakalkund and Gomatikund in the city, are typical spring water bodies, which get extremely polluted due to frequent exodus of pilgrims. It has been established that Kshipra river waters at Mangalnath, Kaliadeh and Triveni should not be consumed by human populations without treatment. The greatest unhygeinic condition in Ujjain exists at the railway station area where children and animals take their bath and use freely. Effluents of textile mills like Heera mill, Binod mill and the nearby calendering plants, join Kshira river untreated. Nose bleeding and lung disorders were recorded in the working populations of Sagan plastic factory and Lotus Chemical factory. It was suggested that the Central or State pollution board or the municipal authorities should strictly implement health standards and arrange for treatment of wastes before they are liberated into the aerial or aquatic environment of the urban area.

## 98. IMPACT OF INDUSTRIALISATION AND INCREASING HUMAN POPULATION ON RIVER GANGA AT VARANASI

B.D. TRIPATHI, MOHD. SINKANDER and MANORANJAN DABAR

*Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi-221005*

From times immemorial the Ganga water has been regarded as a great purifier of human body and soul. A few drops of water mixed with tulsi leaves are poured down in the throat of a last breathing man so that his last journey is safe. However, due to rapid but ecologically unplanned industrialization and urbanization our sacred river Ganga is polluted

and loosing its self purifying capacity at least in some parts during certain months of the year. An ecological investigation conducted on the problems reveals the fact that dumping of effluents of 1500 industries and huge amount of corporation sewage are responsible besides, 25000 to 30,000 dead bodies cremated at Varanasi burning ghats, for the Ganga water pollution. It is estimated that out of total dead bodies 40% come from out of Varanasi district due to religious importance and 60% itself from Varanasi. Floating human dead bodies and animal carcasses adds another dimention of pollution. High turbidity, BOD, COD, coliform and low content of dissolved oxygen (DO) at various bathing ghats indicates the increasing level of pollution. In the above context to save the civilization and culture of India it is necessary to develop and implement "The Ganga Water Pollution Protection Law" besides the Water Pollution, Prevention and Control Act, 1974.

## 99. CLIMATIC CONTROL OF AGROECOSYSTEMS IN WESTERN INDIA

S.C. PANDEYA

*Department of Biosciences, Saurashtra University, Rajkot, 360005, India*

Ecoclimate of western India varies from superparched to arid to semi-arid and dry subhumid. Net water Surplus (NWS) is Surplus minus deficit and water deficiency is PE-AE (potential evapotranspiration—actual evapotranspiration), and will thus indicate deficiency of moisture over PE of a locality. Water Status (WS) is derived from a calculation of annual precipitation received minus PE and change in soil water storage. Whereas, NWS varies from-300 to above 100 mm. WS varies from—500 to 300 mm and is more correlative to plant growth. Depending upon the two indices, western India has been divided into 6 ecoclimatic overlapping zones. Lithology of the area varies from igneous

granite and basalt to matamorphic schist and gneissic complex, sandstone, desert sand and saline patches. There appears a clear interaction of climate and soil condition as the determinant factor. 'Normalished Water Content' is a more expressive index of available soil water for growth.

Regarding status of agroecosystems, under the strongly periodic tropical climate, dryland farming or rainfed agroecosystems (during the summer monsoon months of June/July to September/October) is almost the rule in the region. Winter irrigated crops on an average occupy about 1% of the total 47% of the agriculture land. *Sorghum*, groundnut and *Pennisetum typhoides* as the main cereal and oil crops —arranged in decreasing order of aridity. Cotton is an important cash crop of semi-arid tract.

The study further indicates that the hybrid varieties of the above named crops, although may be potentially higher yielders, yet under the highly variable arid climate have lower growth and yield than the local varieties. Index of Relative Growth Rate has been found highly correlative with the variations in local climate better explaining the adaptability of local varieties. These concepts improve the understanding of the functions of agroecosystems much better than the old concept of Meteorological Equivalent of Azzi (1956).

## 100. WOMEN HEALTH RISK PROBLEMS ASSOCIATED WITH TRADITIONAL FUELS USE AND ENERGY ALTERNATIVES IN INDIA

A.L. AGGARWAL, G. GIRIJA, C.V. RAIYANI, M. RAO, and S.K. CHATTERJEE
*National Institute of Occupational Health, Ahmedabad (Gujrat)*

Ever since the beginning of civilization, a threat to women health still continues in developing or poor countries of the third world due to traditional cooking fuel use

while health risks from nuclear wastes and burning of oil etc. are only being projected by the developed west. Besides ill health effects on women such traditional fuel use as wood, would cause massive deforestation and other environmental impacts. The results presented are of a study under progress in Ahmedabad, clearly indicate the adverse exposure conditions of women population with respect to various pollutants like $SO_2$, SPM, NOx and BaP.

The health effect investigations on different women population groups by taking observations on lung functions MMR and clinical examination also project that the condition of women using traditional fuel deteriorate with age.

The experiences gained In India and China for biogas pits and solar cookers can form the basis for socially acceptable transition from traditional domestic fuel use to a new mixture of energy alternatives.

## 101. EDUCATION NECESSARY FOR A SCIENTIFIC ASSESSMENT OF ENVIRONMENTAL IMPACT OF WATER DEVELOPMENT PROJECTS

K.V, KRISHNAMURTHY
*New Delhi-110017*

In this paper, an attempt is made to present some aspects in which arrangements for formal education appear necessary to undertake an assessment of the environmental impact of water development projects in a scientific and a systematic manner. In addition to the steps necessary for the implementation of the recommendations made at Belgrade, Bangkok and Tbilisi and other Regional Environmental Education Workshops, the importance of implementing the recommendations relating to "environment, health and pollution control" made by the United Nations Water Conference held at Mar del Plata in 1977 is emphasised. A brief summary of these recommendations is presented. Some examples of

the efforts made by Environmental Groups in India are cited as in the case of the Silent Valley Project in Kerala. The experience of some of the developed countries is cited in the field of assessment of environmental impact of public and private projects. In conclusion, the importance of incorporating scientific principles for environmental impact assessment of water development projects in the curricula for environmental education is emphasised.

## 102. PROSPECTS OF ENVIRONMENTAL EDUCATION AT GWALIOR

A.K. BHATTACHARYA, R.R. D. S
*School of Studies in Botany, Jiwaji University, Gwalior*

and J.M. DAVE
*School of Environmental Sciences, Jawaharlal Nehru University, New Delhi*

Visualising the rapid growth in industrialisation and urbanisation the knowledge of environmental hygiene and awareness of pollution hazards has become a necessity. In the sphere of education, in order to foster awareness and understanding of the ecological interdependence, environmental education should be made compulsory in the curriculum of schools and colleges. Gwalior. which is one of the important industrial and cosmopolitan towns of our country, has bright prospects in the field of environmental education. Gwalior with its glorious past has a promising future. It has a locational advantage, being connected with important cities of the country through road, rail, and air. The geographical and geological and natural attributes of the city are of great significance and contribute to the importance of the city from the environmental point of view. Within the distance of hundred kilometers of the city the important establishments and materials for the different types of environmental researches are readily available. Gwalior fantastically presents wide range of socio-economic and socio-professional variates,

and comparison can be made between the environments of these. Now Gwalior is also exposed to rapidly growing industrial and commercial activities in and around it. Some efforts to initiate and propogate the environmental studies and researches at Gwalior have already been made. Some research work and teaching courses pertaining to environmental problems have been accomplished and new ones have also been undertaken. Efforts are also being made to generate awareness of environmental problems among general public through mass media viz. symposia; seminars, and newspapers. It is proposed that this education, while catering to students, should also be imparted to adults and professionals whose activities are directly concerned with preservation, improvement and quality of environment.

## 103. SOCIO-CULTURAL DIMENSIONS OF HUMAN ENVIRONMENT

S.K. CHANDHOKE
*School of Planning & Architecture, New Delhi-110002*

Man, to a large extent, is a product of his environment. Environment is basically of two types—physical and social. In everyday life people use the term environment to mean only physical environment consisting of climate, soil, geological strata, flora and fauna, etc. But we must study the total environment that man as a social being experiences, to which he reacts and renders meaning.

The exploitation and use of, and adjustment with, the physical environment that nature provides in any region depends upon the social environment of the people. All that nature provides may not even be explored and exploited. Moreover, the materials presented by nature may be utilized but it cannot determine how these would be used. That is why in two regions having the same physical environment we find vastly different levels of development and cultures.

Increasing enrichment of culture means increasing liberation of man from the clutches of the physical environment (i.e. nature). There are innumerable instances where whole communities or part of communities having migrated to different regions, repeat their old habitation pattern at the new place, even though the physical environment there may be totally different. Instances can also be cited of small geographical regions within which he find a vast variety of habitation patterns because of cultural variations. The farthest extreme to which culture has freed man from the limitations of the geographical environment is in the modern city.

The social environment of man comprises of his groups, such as family, religion his enthno-linguistic group, its folkways, mores, traditions and customs legends, cosmology and, in that, the total culture. Life is a matter of attitude. The way man reacts to his physical environment is conditioned by the socio-cultural factors.

Even when some facilities for improving the physical environment of a community are provided by an outside agency or by its own members, people utilize only the ones which do not in any way clash with their way of life. The ones that do not fit into their cultural milieu are rejected straightway. The culture of a community faciliates the adoption of certain innovative ideas, practices and attitudes regarding the physical environment while it hinders the adoption of some others.

Hence, it is very essential to educate people, laymen as well as professionals, regarding the process of interaction between the socio—cultural and physical environment.

# 104. STRATEGIES FOR GENERATING ENVIRONMENTAL AWARENESS

S.C. SANTRA

*Department of Botany, Presidency College, Calcutta*

Man has a fundamental right to liberty, equality and satisfactory living conditions in a clean environment and he has a solemn duty to protect and improve the environment for present and future generations. Unfortunately due to lack of awareness of governmental organisations and also among common people of this specific right which they possess, is one of the reasons why there is not greater demand to have the right safeguarded. To survive, let alone mainatin dignified life, requires that we make the best and least use of the environmental resources and protection from detoriation of environment. If we do not sustain them, they will not sustain us.

If a community is to be effective in protecting itself from damage by pollution it needs to have a basic community spirit. If such a spirit is present the community can and should formulate its goals, its policy and its organisational structure and develop a strategy and tactics for determining its own development and protecting itself from pollution. Its policy, which needs to be explicitely stated, should be to bring pressure to bear on local, national and regional government, industry, and agriculture, to achieve and maintain a clean environment.

Looking at what is happening around the world to-day, it seems clear to us that there are some basic problems to be considered right at this moment, like—

1. That environmental protection is economically justified both from the point of view of the community and at the national and regional level;
2. That the damage is likely to cost the community more than it would have to spend to prevent the damage from occuring at all;

3. That the positive contribution environment protection policies make to the developmental enterprises—both public and private.

Many legislative and regulative attitudes and action still relate primarily to the imposition of specific, corrective controls; it is still a fight in many instances for the environmental profession to gain acceptance for pollution—prevention procedures.

## 105. ENVIRONMENTAL EDUCATION—AN APPROPRIATE APPROACH

D. KAUSHIK

*P.G.Department of Chemistry, Goverment College, Kota, India*

The barbarous use of nature and natural resources, associated with industrialization, urbanisation, and population growth have created unhealthy conditions of living and malnourished persons. In the long run, the increasing magnitude of such ecosystem imbalances are bound to lead towards a global catalysm.

Our post—independance educationists have unfortunately forgotten India's age old concern regarding ecological balance. We, in this country have always respected and used wisely our natural resources. Modern man, equipped with scientific technology can play with nature, and temper the very life sustaining system, but he should remember that, "Nature never forgives".

The academic programmes should be planned in such a way as to meet the changing needs of the country. We have seen agricultural and technological revolution with their consequences. Now it is high time when we need an educational reform based on Environmental Education—An appropriate approach.

## 106. NEED FOR ENVIRONMENTAL STUDIES

P.K. DURANI and A.L.N. SARMA
*Regional College of Education, Bhubaneswar*

Over-population, over-technology and over-pollution are the resultant products of industrial revolution which set in motion the wheels of heavy industry and changed the course of destiny of human civilization. As such these triple environmental errors confronting the contemporary society and posing a menace to the posterity awakened and necessitated environmental consciousness all over the world. For a successful planning and implementation of the socio-economic programmes and for a rational explanation and exploitation of environmental resources, a knowledge and education of the environment and its resources is a pre-requisite and mandatary. Therefore, there is a dire need now than ever before to awaken environmental conciousness among the growing millions of people about the imminent threats of pollution resulting out of indiscriminate use and abuse of the environment in a mad frenzy to step up production deploying science and technology.

The curriculum for environmental studies should be flexible, diversified and responsive to contemporary national problems, current community issues and prevailing learner's concern. The NCERT has made considerable efforts in the direction of introducing Environmental Studies in the 10+2 pattern of Education System. All possible efforts are also to be made for the adaption of non-formal education. This should be flexible, life-environment and learner-oriented, nonauthoritarian, and be fabricated on learner's active participation. It ought to mobilize local resources for educating all age groups and section of the society—child, youth, adult, workmen and women, the unemployed and leisured, literate and illiterate, urban and rural people.

## 107. HOW ECO-DEVELOPMENTS AND SOCIAL FORESTRY MAY BE MANAGED IN VILLAGES IN THE INDIAN THAR DESERT

INDRA KUMAR SHARMA

*IUCN, Bhagwati Bhavan, Ratanada Road, Jodhpur-342020, India*

Because of rampant growth of villages and towns and indiscriminate exploitation of nature, thereby have deteriorated ecosystems around villages and towns. Ecosystems and possible social forestry around villages and towns were studied in the Indian desert. Villagers indiscriminately cut trees and shrubs for firewood and their massive livestock denude grass-covers by overgrazing, stray dogs of villages hunt the hare, antelopes, partridges and other fauna and robs nests of ground birds; the house crow badly hit populations of several wild birds by robbing clutches and broods of birds. In this way villagers directly as well as indirectly badly hit ecosystems around their villages, unaware of ultimate bad effects on themselves. Planting of *Ficus bengalensis*, *F. religiosa*, *F. mysorensis*, and *Albizzia lebbeck* at squares and out skirts of villages and towns may considerably improve vegetation reducing air pollution with favourable environment to several avian and mammalian fauna. Small parks and green traffic islands in towns with *Tecoma stans*, *Thevetia nerriifolia*, *Nerium indica*, *Hibiscus rosasinensis* and *Lantana* spp. etc., may present charmful aesthetic environment of flower blooms and beautiful butterflies and birds. *Prosopis juliflora* may be grown successfully at arid and semiarid wastelands within social forestry programmes, that may sufficiently supply villages need for firewood, huts and farms, fencing wood materials and legume-fodder, Ber (*Zizyphus mauritiana*), pomegranate, Lasoda (*Cordia myxa*) and vine and vegetables may be successfully grown by sewerage water at home gardens and social forestry lands. Considerable wide area scrubs may be developed as pasture with introducing

hardy palatable grasses, irrgating these with wells or even by sewerage, for village livestock. Local timber trees as *Tecomella undulata* and *Acacia nilotica* should be grown in agriculture farms, at depression areas and social forestry areas to supply timber need of villages.

## 108. SOCIAL FENCING AND INSTITUTIONALISATION OF GREEN GOLD FARMING IN THE HIMALAYAS

P.R. MISHRA

*Central Soil and Water conservationResearch and Training Institute, Research Centre, Chandigarh*

Discussing various models of environment degradation in the Himalayas and consequent social unrest, the paper highlights the need of linking education with long range environment productivity. It attempts to quantify huge amount of social wealth from social fencing as a vital ingredient of social synergy.

The paper presents various models of tree farming and advocates its Institutionalisation in schools and colleges. It is suggested that production technology for raising trees, fruit and medicinal plants, together with resin tapping, saw milling, honey making, mushroom cultivation, nursery technology and technology for logging, fruit packing, jam making and dairy farming including raising of fodder grasses be taught and the feeling of interdependence of man with the hilly environment be inculcated in the minds of every boy and girl. Processing and manufacture technology of various products of forest is also recommended to be included in the course. Every institution be provided a hilly sub watershed for developing institutional farm and small factory, where every effort is recommended to be made to generate entire institutional expenditure from farm and factory.

Traind to produce the most and waste the least the products of such institutions will learn to seek productive employment from hilly environment and will attempt to establish the missing link between conservation and production and between producers and manufacturers. Increasing job opportunities through befitting research and improvement in production, manufacture and marketting should also be the responsibility of such institutions. The paper advocates for a quick beginning atleast at some places.

## 109. ECO-DEVELOPMENT CAMP

V. KANDE-KIROLI
*District Pithoragarh, U.P.*

Sponsord by the Himalaya Seva Sangh, a week long camp was organised in village Kande Kiroli, District Pithoragarh, in Uttrakhand from July 22, 1981, under the auspices of Berning Gram Swarajya Sang, with the help of a grant from the Department of Environment, Government of India.

The camp was attended by teachers, students, Gram Pradhans, local peasants and several Forest officials, besides workers of the Sangh.

The campers utilised two days for visiting neighbouring villages on foot and explained to the people the harm caused by indiscriminate tree felling.

The cultural progrmme presented by the School children's Society was extremely interesting and attractive. In this programme the medium of question-answer was utilised for popularising the need and benefit of afforestation, protection of environment, education and house-building. The programme was very much appreciated.

Paper presents response of participates and people of neighbouring areas to such programmes.

## 110. EDUCATION FOR SURVIVAL AND DEVELOPMENT: AN ACTION PROPOSAL

ARTTABANDHU MISHRA

*School of life Science, Sambalpur University*
*Jyotivihar, Burla-768017, India*

An operational model of relationship between ten natural resources, human needs and activities have been enumerated to form the basis of Environmental education for survival and development. Appropriate actions for the development of an educational environment for Environmental Education over small areas of human habitation outlining the informal educational models and formal educational curriculla are suggested. Strategies of human environment interaction recognise global importance but local action programme as the best strategy to achieve the result. These aspects are discussed in detail with equations and diagrams.

## 111. YOUTH ECO-DEVELOPMENT CAMPS FOR ENVIRONMENTAL EDUCATION

ANILRAJ JAGDALE,
*Deptt. of Geology,*
*G.K. Gokhale College, Kolhapur*
MOHAN D. TAWDE,
*Deptt. of Geography,*
*Shivaji University, Kolhapur 416 004*

Environmental conservation involves teaching and action oriented programmes spread over generations. The young generation in the developing countries, where the problem of environmental conservation is of high gravity in the absence of ecological understanding, forms the target group for environmental education. Environmental education is meant to make one understand and appreciate the interrelatedness

among man, his culture and his bolspheical surrounding. It also further entails practice in decision making and self formation of a code of behaviour about issues concerning environmental quality.

Eco-development camps for college youth have been recently held in Maharashtra through this perspective. The missing concept in the present university education is the socialisation of the youth for making them responsible citizens. The environmental education through the action oriented eco-development camps would be able to socialise the youth for the participation in the process of environmental conservation and development. These eco-development camps, with an interdisciplinary base, would encompass themes like socialisation, appropriate technology for balanced ecological development and a deep understanding of the role of environment in the survival of mankind. Such Eco-development camps would serve as a diffusion model in the nonformal environmental education.

## 112. ROLE OF KERALA SASTRA SAHITYA PARISHATH IN ENVIRONMENTAL EDUCATION IN KERALA

M.K. PRASAD
*KSSP, Kerala*

The Kerala Sastra Sahitya Parishath (KSSP) which spearheads the 'peoples' science movement in Kerala with the objective of making science a tool for social revolution, has been actively engaged in Environmental Education also. As part of its mass contact programme KSSP has been conducting regular study classes, way side lectures, exhibitions, seminars and demonstrations through folk art, imparting education on environmental problems. Special themes of interest for these programmes have been ecological crisis, development

and nature conservation. These themes were introduced through case studies, especially those which became sensational in the state viz. (i) The Thannirmukkam Barrier of Kuttanad (Alleppey Dist.), (ii) The Silent valley Hydel Project (Palghat Dist.). and (iii) The Chaliyar Pollution (Calicut Dist). These case studies were made by special teams of KSSP, highlighting the socio-economic and environment impact analysis of these projects, telling the common man how development without conservation could be disasterous to community. Alternatives for achieving the benefits and remedies for problems of pollution were also suggested.

Latest of KSSP's efforts in this live was to educate and involve people of an entire district in social forestry. As a result people volunteered to plant saplings and prepared to protect them, which has been a singular experience in the state. It is the experience of KSSP that the masses could be educated in problems of environment provided we programme education involving their day-to-day experiences and take to them in their own language.

## 113. "THE SIERRA CLUB AND GLOBAL ENVIRONMENTAL EDUCATION"

RICHARD TUCKER
*Sierra Club International Committee,*
*800, Second A Venue,*
*New York, N.Y. 10017, U.S.A.*

The great environmentalist John Muir founded the Sierra Club in 1892, to rally public opinion in defense of his beloved Sierra Mountains of California. Since then the Sierra Club has grown to over 200,000 members, becoming one of the country's most powerful lobbies for wise long-range use of natural resources. Our International Programs Office was opened in New York a decade ago, to coordinate the Club's

international work and provide liaison with international organizations including the United Nations Environmental Program, UNESCO's Man and Biosphere Program, and the International Union for Conservation of Nature and Natural Resources.

As a major citizens' organization, the Sierra Club has been a leader in raising questions with the American government concerning environmental implications of foreign policy decisions. We participate in government advisory committees to shape United States policy at international meetings, provide environmental input by representation on delegations, monitor international negotiations and make known our interests to political and government officials. To support these efforts, we publish factsheets, working papers and other kinds of policy-related materials. Among our major emphases so far have been protection of tropical forests, protecting the oceans, regulating global use and distribution of toxic substances, transnational air pollution, and preserving Antarctica's resources. In each of these areas we have published background studies and organizational materials which may be helpful to allied organizations in other countries.

The major point of contact between the Sierra Club's International Office and friends around the world is our International Earthcare Centre, which established an Earthcare Information Network in 1980. Concerned with the long-term environmental issues which transcent national boundaries—the global problems which no nation or organization can solve alone, its aim is to sharpen awareness of the environmental consequences of technological and economic growth. Through the Network, the Earthcare Center can provide a base of ecological and resource management information specifically designed for those responsible for making policy decisions and informing the general public. Its initial information foci include new and renewable energy source, ocean resource development, tropical forest management, habitat

destruction and wildlife, and international environmental law.

The Network has a system of associated organizations in a steadily expanding number of countries, which in their own ways reach out at networks and sources of information. They use the information from thee New York office, countribute materials from their own countributries, and help determine additional high-priority subjects for our attention.

In response to recent inquiries from several countries, we are preparing a set of grassroots organizing and educational materials for citizen's groups interested in participating in long-range environmental planning. We welcome advice and evaluation from groups and individuals in other countries, in order to make these materials more applicable to their needs. And we heartily encourage all inquiries about the resources of the International Earthcare Center.

## 114. THE ROLE OF RESEARCH AND DEVELOPMENT INSTITUTIONS IN ENVIRONMENTAL EDUCATION

S.H.C. DE SILVA
*Directorate of Irrigation, Sri Lanka*

Increasing environmental degradation has shadowed human existence in the planet from the time human-beings began to exploit the earth's resources in earnest. If one were to relate this point of time in the earth's life scale it is of recent origin. The industrial revolution in the 19th century can be the reference point of this eco calendar. With the growth of industry sprang new technology and new energy sources, Research and Development Institutions has their hands full. Their targets were increased production at lowest cost to maximise profit. But this course led to increased

pollution of the environment with mounting harmful and toxic wastes.

The impact of environmental pollution control measures caused the re-orientation of the thinking of the R and D Institutions, from maximising profit to deploying a share of same in processes necessary to cleanse the environment. It is ironical that R and D Institutions themselves had to be the vehicle for the new strategy which will consume part of the profit structure in its efforts to rehabilitate the eco system. The role of these institutions in environmental education is therefore peremptory though perhaps biased.

Although industry moved increasingly into the third world in search of cheaper labour and availability of raw materials, the R and D institutions preferred to gravitate to the developed countries. Thus the well epuipped laboratories continued to thrive in their home countries while only the manufacturing complexes and finishing processes became established in the third world. Thus even when the L.D.C.'s produced professionals who could man R and D institutions in their native countries they found no avenues to use their "know how" resulting in frustration and contributed to the Brain Drain.

## 115. SALINITY– AN INCREASING ENVIRONMENTAL HAZARD

**RAVI SHARMA**
*Department of Botany K.R. PG College, Mathura-282001*

**B.D. BAIJAL and A.K, GOYAL**
*Plant Physiology Laboratory, Department of Botany, Agra College, Agra*

Salt is the savour of foods but the scourage of agriculture: in excess it kills growing plants. Soluble salt conta-

mination of soil has caused problems throughout world. As for nature, this planet of ours is a very salty place. About 70 per cent of the surface of the globe is covered by oceans, a third of the land area is semi-arid or arid, and half of that area has highly saline soils. The problems of soil salinity and of saline irrigation water are not restricted to any specific region of the world. These are of world wide occurrence. On every continent, and in practically every country, very extensive areas of soil are affected by primary, natural, or by secondary, often man-made, salinity. They are well known in the humid countries of Europe (Holland, Sweden, Hungary, Russia) as well as in the arid regions of the Mediterranean bain, the Middle East and India, South America, Southwestern United States, etc. In short, there is hardly a region without some problems involving salinity. In agriculture the problem of salinity becomes more severe every year as the non-saline soils and the non-saline waters become more intensively and more extensively exploited. The effects of salt devastation are apparent in many areas and are becoming increasingly prevalent and serious as land use intensifies and water becomes more limiting and increasingly polluted with soluble salts. Moreover, industrial development in many countries is causing severe water pollution, especially of rivers, and mismanagement in agriculture often induces secondary salinization of soils and source of irrigation water.

## 116. SOME ASPECTS OF MARINE POLLUTION

K. KRISHNAMURTHY

*Centre of Advanced Study in Marine biology, (of Annamalai University) Parangipettai 608502, Tamil Nadu, India.*

The paper deals with varied aspects of pollution of the marine environment. Man has become the worst pollutant

in recorded history. The marine biocycle is vulnerably exposed on all fronts to pollution hazards due to man. The impact of pollution has already been felt even in far away Antarctica. The effects of pollution upon marine biota, type of pollutants and the pathways to man are examined. The sources of pollution, the interaction of the atmosphere and biosphere, and the control of pollution are outlined. The jurisdictional responsibility, management strategy, man's alteration of environment and implication of his activities are discussed. The imperative need for judicious uses of the biosphere for ensuing the quality of the environment and for the future of the oceans for the benefit of our posterity is stressed.

## 117. "THE SIBERIAN CRANE AND ENVIRONMENTAL EDUCATION"

STEVEN E. LANDFRIED
*U.S.A.*

The plight of the Siberian Crane—now numbering less than 250 birds—lends itself to study in a wide range of educational contexts. The presentation will examine curricular implications of the Siberian Crane's migration from the Soviet Union to Iran, India, and China and threats to its existence posed by man.

## 118. INSECTICIDAL POLLUTANTS IN THE ENVIRONMENT AND THEIR EFFECTS ON FRESH WATER FISHES—WITH REFERENCE TO INDIAN STUDIES

A.K. PANDEY and LATA SHUKLA
*School of Studies in Zoology, Vikram University, Ujjain 456 010, India*

The organism and environment are obviously defined in terms of each other. Their interrelationship and interactions

are governed by laws and they form complementary factors. Pollution is always referred in a relative sense, when natural components of the environments are changed in quality and or quantity as well. It is generally accepted that such changes are brought about by chemical, physical or biological factors or components of the environment. Insecticides, although much useful in the agriculture and public health managements, pose threat to the environment and the organisms. These ultimately, as by now established, change the ecosystem on the globe. These insecticides behave as pollutants when considered for their action on the non-target organisms. The nondegradeble insecticides are generally form chronic burdens in the ecosystem, these are termed as chlorinated hydrocarbons and are mostly available in the market as DDT, Aldrin, BHC, Sonatax, Termex, Endosulphan, Heptachlore, Endrin etc., while the degradable ones are termed as organophosphorus and carbamates and commonly used and marketed as Malathion, Rogor, Dianion, Sevin etc.

The current trends in the biological investigations also include these pollutants and their effects on the fish, which mainly concerns to the aquatic toxicology, mass mortality, pathology and the physiological changes in various species. Indian laboratories are also contributing the results depending upon the model and mode of investigations. Now one can collect information on the various aspects of the effects of the insecticides on fish, these are mostly laboratory experiments, however, field studies need more attention. The chronic and short term exposure have been done on carps, minor carps, catfishes, airbreathing fishes, exotic species and on several other teleostean forms. The present survey deals with the studies contributed from India. However, the results clearly indicate that the insecticides produce many significant changes in fish. Further, it is observed that the chlorinated hydrocarbon as well as the organophosphorus insecticides influence equally. It is therefore suggested that the insecticides need very careful

manipulation for the proper utilisation of green and blue revolutions.

## 119- A PROPOSAL OF ENVIRONMENTAL EDUCATION PROGRAMME FOR THE PEOPLE OF THE U.P. HIMALAYA.

H.S. BISHT, and VINOD K. WISHARD,
*Department of Geography, Kumaon University Campus, Almora*

It seems to have been realized by now that the U.P. Himalaya is at a loss to determine as to how to save itself from increasing number of disasters which have obviously been the result of numerous disturbances in the ecological system of the area with high degree of intensity and magnitude in the recent past. Heavy loss of topsoil, extensive and unscientific deforestation and lopping, flood and landslide disasters, geological and geomorphological catastrophes, decreasing number of springs and descending trend of baseflow levels, eutrophication and pollution of the lotic and lentic waters, decline of the fish fauna, general rise in atmospheric temperature and fall in precipition depth, alarming low summer discharge values of some of the streams, loss of huge quanities of the monsoon water, and so on have been experienced as the results of the constant disturbances in one part or the other of both the space and time in the U.P. Himalaya, which altogether seems to provide ample apportunities for the encouragement of launching some concrete environmental education programme for the local masses who should be very effectively approached both directly and indirectly.

As such, this paper attempts to propose an environment-

al education progrmme for the people of the U.P. Himalaya specially framed according to their need, physical environment, and socioeconomic status. The paper also tries to emphasize not only the inclusion in the programme of conservation of the natural environment but also the need for redefining some of the hitherto conventionally used terms like deforestation, afforestation, conservation, etc. as it seems to be necessary for educating the natives on the lines drawable afresh as indicated by the need for and consciousness towards defending and reconstructing the Himalayan ecological frontiers.

## 120. THE PHILOSOPHY AND PRACTICE OF ENVIRONMENTAL EDUCATION IN THE TROPICS: A CRITICAL ASSESSMENT

MICHAEL H. ROBINSON

*Smithsonian Tropical Research Institute P.O. Box: 2072, Balboa, Republic of Panama*

In this paper it is argued that environmental education and the environmental movement both suffer from the enligh ment fallacy. This is defined as an idealism centred on the idea that major political and social problems can be solved by education/enlightenment alone. This view is herein characterised as being unrealistic and particularly irrelevant to the environmental problems found in most tropical countries. These tropical problems are, it is suggested, primarily caused by the expression of urgent and fundamental human needs. Despite this realistic pessimism, an important role for environmental education in preventing mistakes that arise from ignorance, is conceded. It is also suggested that environmental education can exert a genuine pressure for the amelioration of the worst consequences of economic development. A consequence of environmental education is that it inevitably has political consequences. This, although embrassing to governments, must be ultimately beneficial.

A contrast is drawn between the environmental problems facing the developed nations and those that face the developing nations. From this two seperate schemes for environmental education are proposed. These have radically different centres of emphasis. Finally, some practical suggestions are made for biological studies that can be used as material for tropical environmental education.

## 121. LEVEL OF DEFORESTATION IN INDIA: IMPACT ON ENVIRONMENT

**V.N. VASHIST and P.R. BOSE**

*National Institute of Science, Technology and development Studies, CSIR Complex, Hillside Road, Pusa, New Delhi-110 012*

Traditionally wood has been the major fuel source to supply energy for assorted jobs including domestic requirements. The forests which covered about 33% of the land area at the time of partition of India has been reduced drastically during the last three decades to about 22.8 percent. It is estimated that 50 lakh hectares of the forest area in Asia is lost every year. while in Africa it figures about 20 lakh hectares per year. In India during the period from 1951 to 1961 alone 18,36,250 hectares of forests were lost to projects connected with extension of cultivation, irrigation and power development and rehabilitation of refugees. In India the per capita forest area is 0.13 hectares against the world average of 1.08 hectares. Statewise, Tripura enjoys the first positiou in forestry occupying 57.5% of its total geographical area while Haryana has the lowest position figuring 3.3% of its total land area. However, in the country 7 million hectares of 'Usar Land' can be utilised for plantation and in addition 1,462,000 kms strip plantation can be done along railway lines, roadside and canals.

The economic cost of pollution damage in developed countries is estimated to vary between 3.5% of their respective GNP but the cost of environmental policies ranges only between 1—2%. According to Dr. Myer, a Nairobi based consultant on environment and developmeht, the desertation is advancing at the rate of 100,000 sq. kms each year at the world level thus affecting 50 million people annually. Due to deforestation about 6,000 million tonnes of top soils are lost every year by soil erosion in India. The rainfall analysis of the last three decades shows that Assam's rainfall decreased by 3.2% due to deforestation activities. The 'Red Book' released by the world wild life organisation indicated that some Indian animal species namely dear, hangul, snow-leopard, pasham goat, markhoor, patridges, chakoor, python and cobras will be lost permanently if not protected properly. These species require dense forest for their protection. Merciless wood cutting, unauthorised occupation of forest lands and failure to implement forest plans are major reasons for this state of conditions. Poor replantations, reclamation of waste/desert lands and pressure of urbanisation are also responsible for impairing the condusive environment. The quantity of carbon dioxide in the earth's atmosphere is increasing steadily at the rate of about 0.2% per annum.

In addition, forestry provides us raw materials for small scale industries in the fields of medicine, dairy, oil, canning, tanning, paper and sports goods etc. It has generated employment to about 14 million people. During the year 1980-81 the amount of revenue earned from this sector stands Rs. 2,043 million, which is 2.3% of the national revenue. But the Sixth Five Year Plan provision for forestry is about Rs. 693 crores which is 0.98% of the total plan outlay.

The forests are inseparable part of the whole ecosystem around us and a condusive environment is *must* for the survival of life on this biosphere. Hence, it is obligatory on

Government as well as individual level to achieve the main objective of conservation of existing forests and launching of a country wide afforestation and social forestry programmes. The Sixth Five Year Plan says, "Tree For Every Child", such programme should be taken as a very special project on national level taking care that species of trees selected for plantation in a particular area should have a close relevance to the eco-system of the area.

## 122. A BLUE-PRINT FOR INTEGRATED ENVIRONMENTAL EDUCATION IN INDIA

**K. RAVI**

*School of Planning Center for Environmental Planning and Technology, Navrangpura Ahmedabad-380009.*

Environmental Education in India is often identified as an effort in creating environmental awareness among the people, particularly through mass-media. Though some results were obtained in this direction, we are yet to give shape to a National Environmental Education Programme. Hence, it is high time to evolve a formal Environmental Education Programme at the primary, secondary and tertiary levels of our education system. A three stage Environmental Education Programme is discussed here. When in the primary level an integrated approach (consisting of both formal and non-formal) is suggested with a view to motivate and inculcate environmental awareness and enable the children to learn environmental issues, in the secondary level a field-class-class room approach (on ecology, forestry, agriculture, industry etc.) is discussed. In the third stage, a synthesis of technoscientific aspects, ecological aspects and social science aspects is suggested. Such a curriculum will help make environmental technicians trained in all aspects of environment. Thus, when the primary and secondary level

environmental education will help generate environmental awareness and positive attitudes towards environment in the coming generation, tertiary (graduate and post-graduate levels) level education will help generate technically sophisticated and multi-disciplinary environmental technicians who's services will be very much needed for future development efforts (in which economic growth and environmental balance has to be maintained simultaneously). The limitations of multidisciplinary environmental education in countries like India is also discussed.

## 123. INVOLVING RURAL CHILDREN IN ENVIRONMENT AND DEVELOPMENT ISSUES: A CASE STUDY FROM KENYA

DAVINDER LAMBA and DIANA LEE SMITH

*Mazingira Institute, Nairobi, Kenya*

Eighty per cent of Kenya's population lives in rural areas, and the issues of environment are also those of development-protection of and access to safe water supply, protection and management of forest resources which are the only source of fuel for most people, and so on. The schools are an important leverage point for development, constituting an active and literate part of the population with time and other resources to devote to environment and development activities. However, too often rural schools lack teaching materials and contact with others on these issues. Mazingira Institute has a program of information which goes out once a year by mail in the form of an entertaining Children's Magazine, Rainbow, to every school in the country and then collects information from children in the form of competitions. So far, one book has been published on "The Uses of Trees and Shrubs Identified By Rural Children In Kenya" using competition results, and data on fuelwood supply and

use is currently being processed from the 1981 Energy Competition. There is a follow-up project developing Agro-Forestry plots in a few schools, but the main benefits are the dissemination of useful materials to schools which have almost no resources, and the children's sense of participation and contribution to the accumulation of knowledge and development.

## 124. AWARENESS OF PROBLEMS ON ENVIRONMENTAL POLLUTION IN BANGLADESH

DR. SYED BAZLEY ALI

*Bangla Desh*

The facts that like most of the other developing countries of the World, the problem of Environmental pollution in Bangladesh did not take an unwieldy proportion in the past as such public concern of any perceptable degree did not arise.

With rapid growth of population and urbanisation and urbanisation alongwith haphazard development industry, the problem is increasingly developing in last few years and of late attracting public attention.

Many Government and non Government institutions and organizations at precent are working on this problem mainly engaged in creation of public awareness of the problem and tackling their solution where ever necessary.

Environmental poilution control Board an Government Organization takes care of Govt. policies and programmes of preservation and enhancement of the environment to evolve a better environmental surrounding to allow the masses of Bangladesh to enjoy a richer, fuller and more meaningful life.

Non Government organization like Society for Conservation of Nature and Environment (SCONE) is one of the few societies working in the direction of creating public awareness about the problem of environmental pollution through various mass media.

With the passage of time and increase in intesity of the problem Bangladesh is in the process of evolving a long term plan to educate and motivate people of all stages so that they can handle it before it grows aut of proportion.